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TECHNOLOGIES

MCSE

Microsoft Certified Solutions Expert

Course Presentation

Windows Server 2012

MCSE

(Microsoft Certified Solutions Expert)

Server Infrastructure

Course Presentation
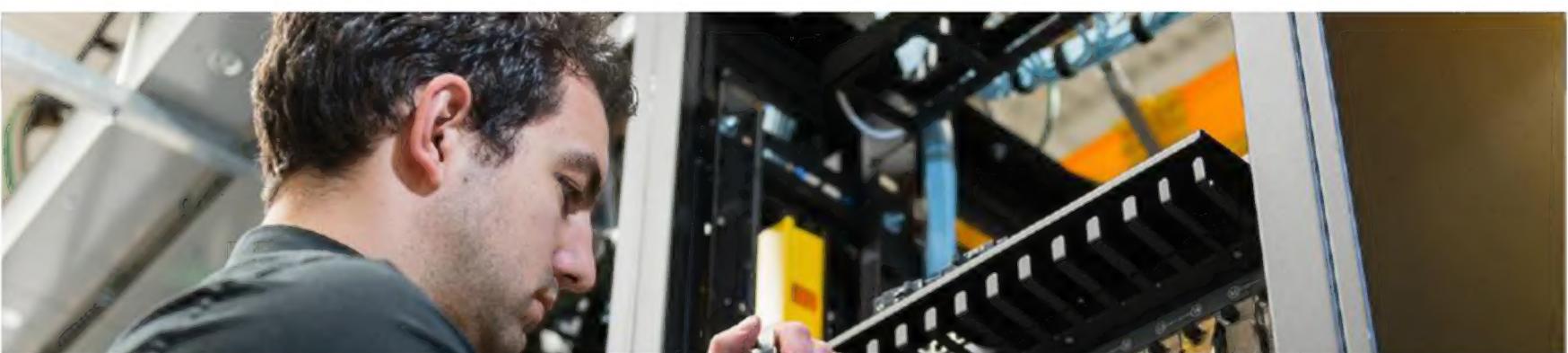
MCSE

INTRODUCTION TO MICROSOFT CERTIFICATIONS

Server Pathway
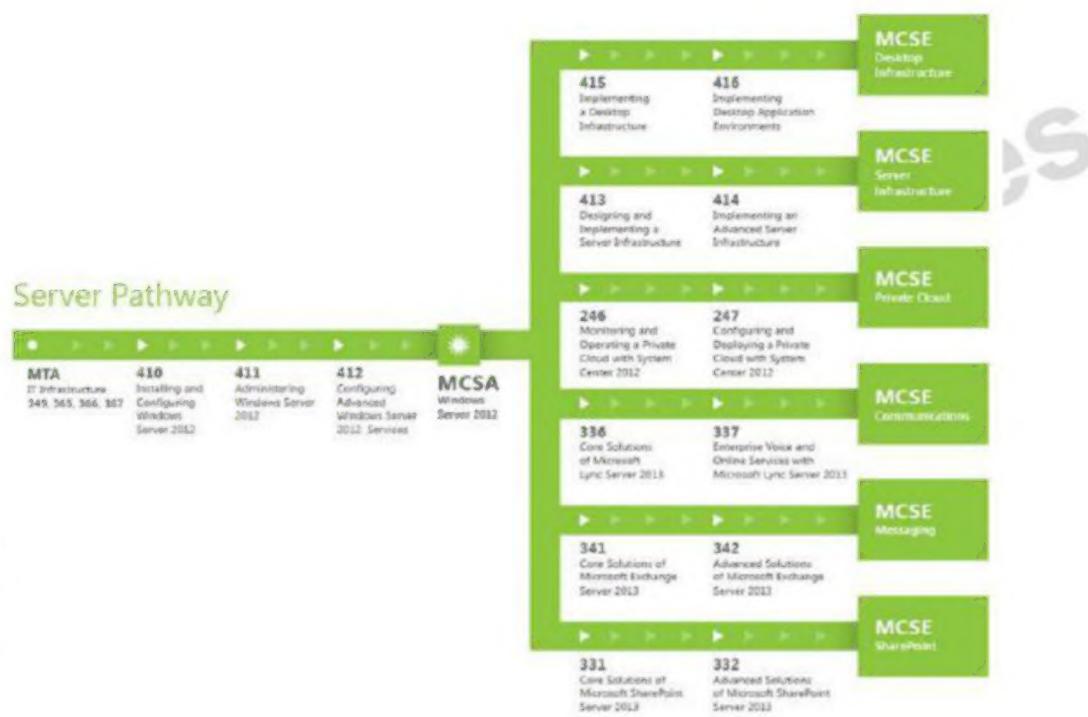
MCSA – Windows Server 2012

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Reference Books

Exam Reference Guide – MS Press

70 – 410 – Installing and Configuring Windows Server 2012.

70 – 411 – Administering Windows Server 2012.

70 – 412 – Configuring Advanced Windows Server 2012 Services.

70 – 413 – Designing and Implementing a Server Infrastructure.

70 – 414 – Implementing an Advanced Server Infrastructure.

- **Network**

  – **A Network is an Interconnection of devices**

- **Networking**

  – **Networking is the communication between the interconnected devices**

What is Network ?

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CLOUD EXCHANGE M C S E
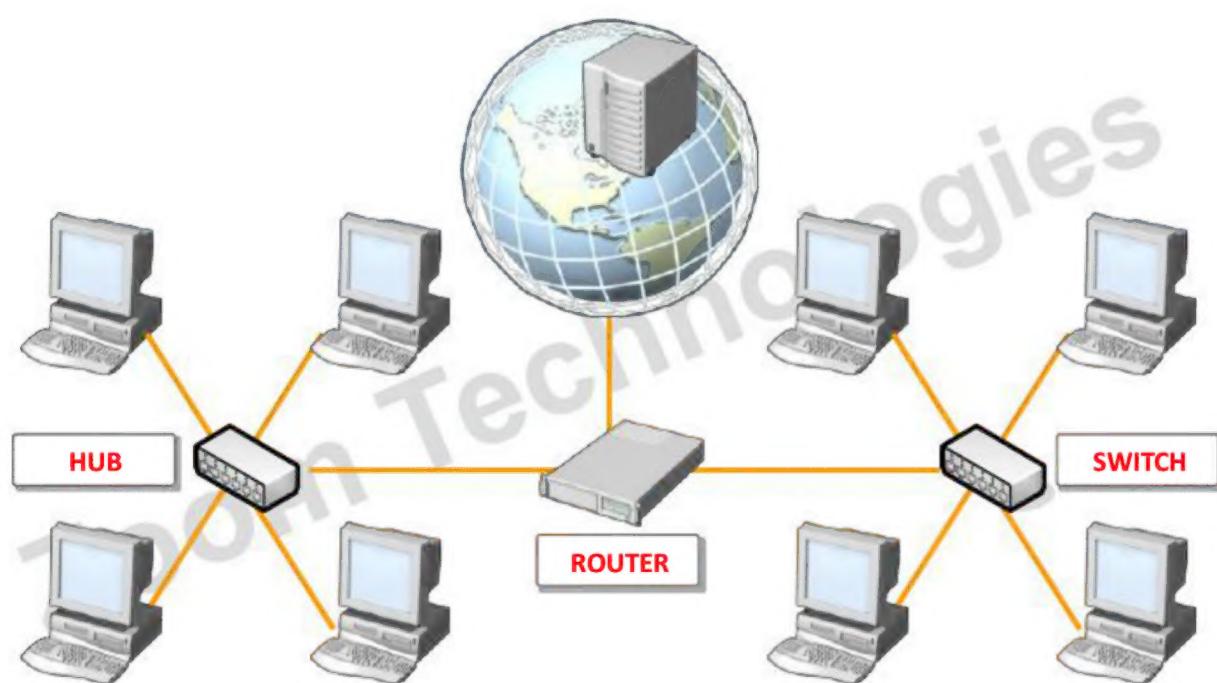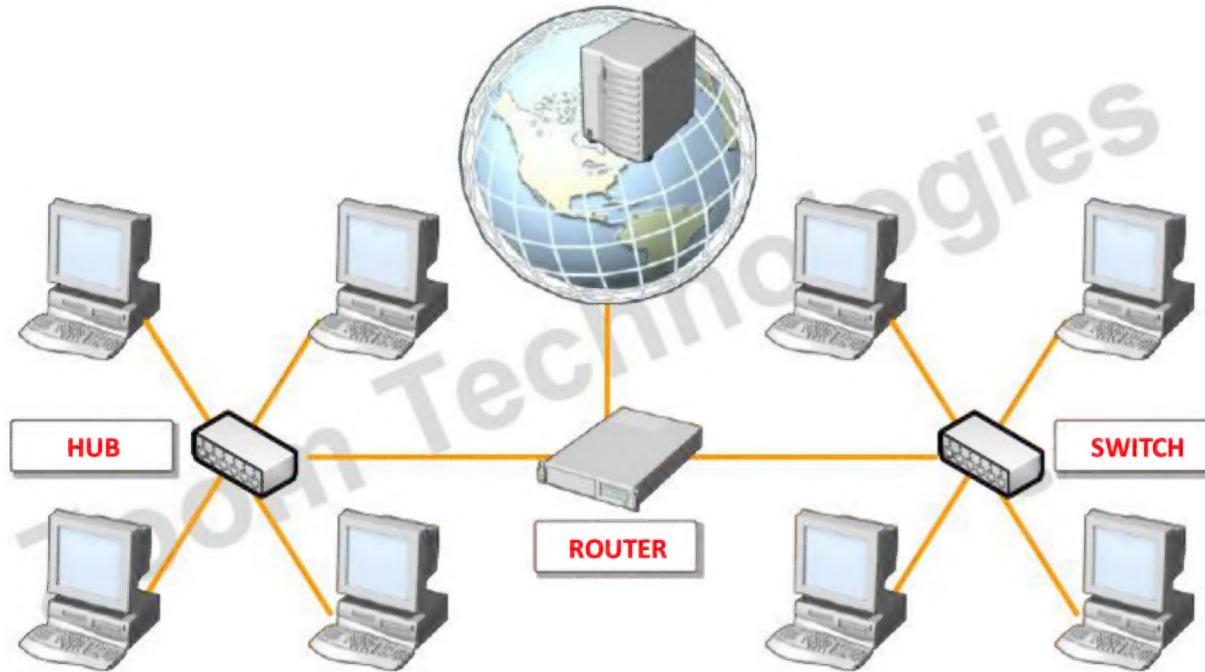
Types of Networks

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- **Local Area Network**

    - **Operate within a limited geographical location**

    - **Provides full-time connectivity to local services**

- **Metropolitan Area Network**

    - **Spans within a city**

    - **Provides full-time & part-time connectivity**

- **Wide Area Network**

    - **Operate over a large geographical location**

    - **Provides full-time & part-time connectivity**

CLOUD EXCHANGE M C S E

Banjara Hills

LAN
(Local Area Network)

Banjara Hills

Secunderabad

LAN
(Local Area Network)

LAN
(Local Area Network)

MAN

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Banjara Hills
Hyd, INDIA

Redmond
Washington,USA.

LAN
(Local Area Network)

LAN
(Local Area Network)

ROUTER

WAN

CLOUD
EXCHANGE
M C S E
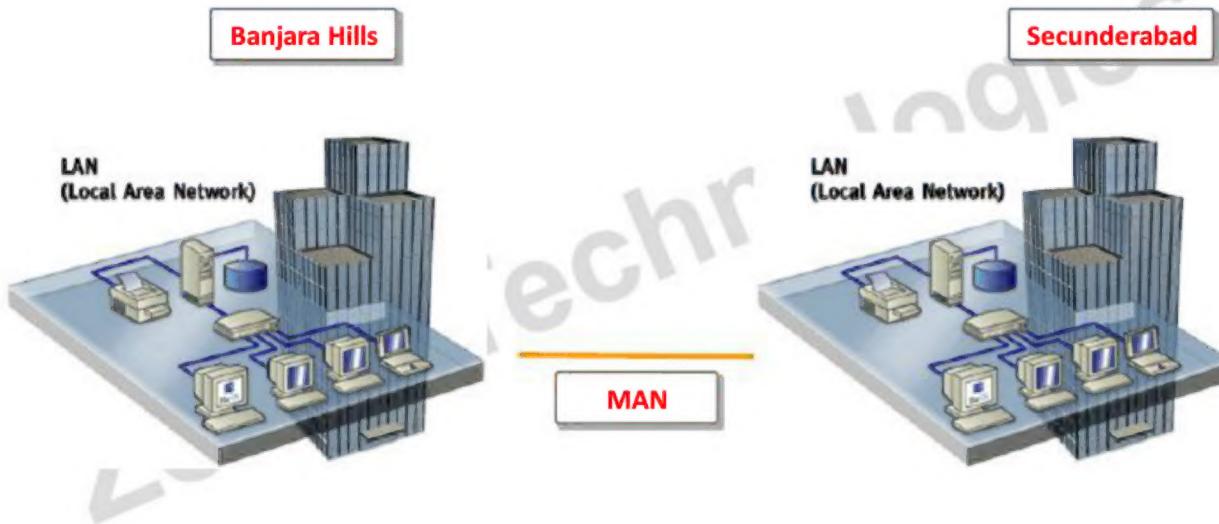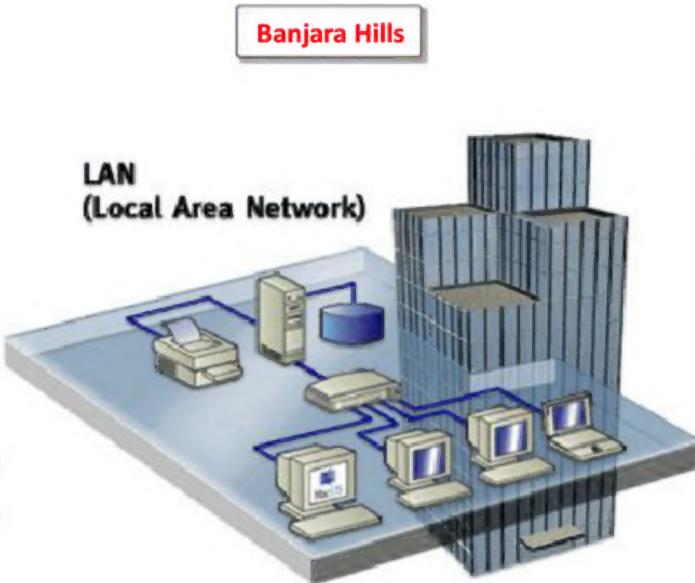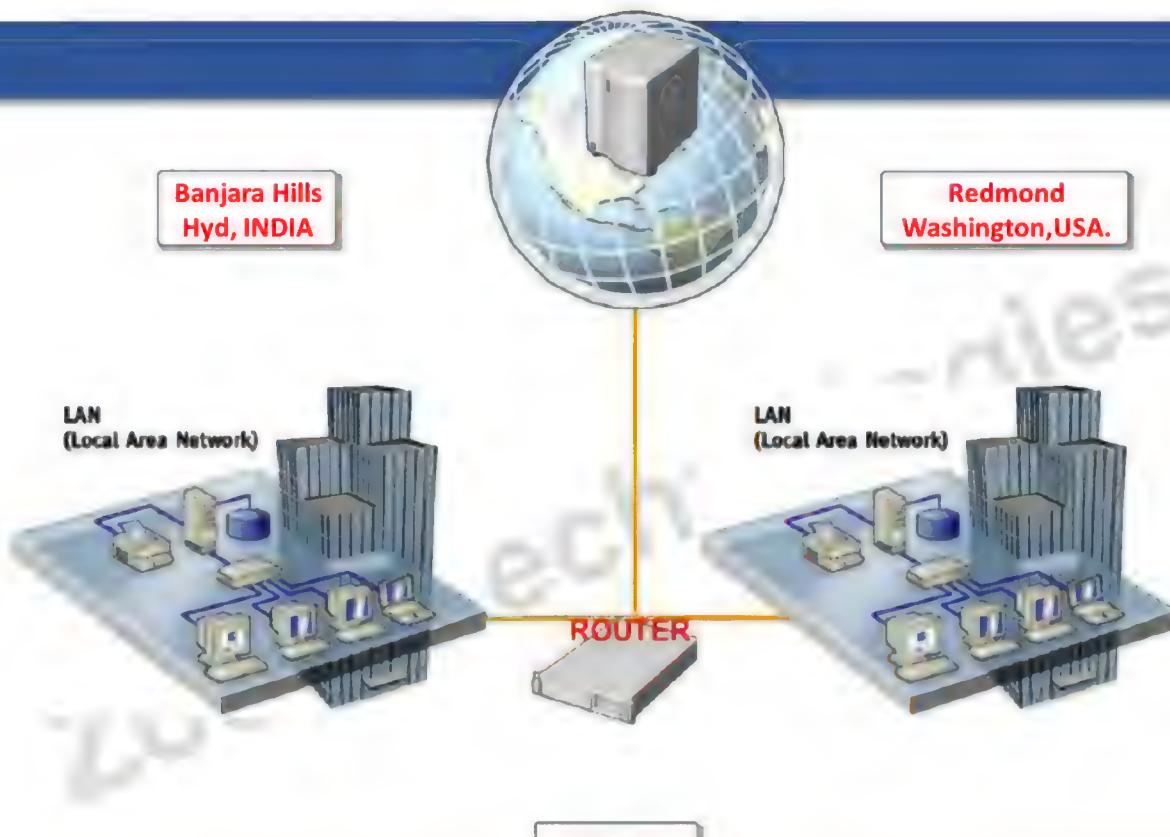
Network Devices

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- **NIC**

  The Network interface card is frequently called a NIC. It forms an interface between the networked device (Computer) and the Ethernet (LAN).

- **MAC ADDRESS**

  A Media Access Control address (MAC address) is a unique identifier assigned to network interfaces for communications on the physical network segment.

  Example - 01-23-45-67-89-ab

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- **Hub**
  - It is generally used to connect all devices on a network so that they can communicate with each other. It always do broadcasting
- **Switch**
  - Like Hub, it is also used to connect all devices on a network so that they can communicate with each other. But first time it will do flooding and from second time onwards it will do unicast.
- **Router**
  - Router is device which allows communication between two or more different networks present in different geographical locations.

Computer1 sends DATA to Computer4

Computer3

Computer4

DATA

Computer1   DATA

Computer2

How Hub works ?

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Computer4 sends DATA to Computer1

Computer3

Computer4

DATA

DATA

Computer1

Computer2

How Switch works ?

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Computer1 sends DATA to Computer4

Computer3

5e7c-3a2c-1d9c

Computer4

5e7c-3a2c-1d9d

Mac-Address Table	
Mac-address	Port
5e7c-3a2c-1d9a	1

1

2

Computer1 DATA

5e7c-3a2c-1d9a

Computer2

5e7c-3a2c-1d9b

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Computer4 sends DATA to Computer1

Computer3
5e7c-3a2c-1d9c

DATA
Computer4
5e7c-3a2c-1d9d

3

4

5e7c-3a2c-1d9a

5e7c-3a2c-1d9c

DATA

1
4

Computer1
5e7c-3a2c-1d9a

1

2

Computer2
5e7c-3a2c-1d9b

CLOUD
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M C S E

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Banjara Hills
HYD, INDIA

Redmond
Washington, USA.

Comp1-LAN1 sends DATA to Comp4-LAN2

Comp4

Router

DATA

HUB

1

LAN2

2

SWITCH

Comp1

DATA

WAN

LAN1

LAN2

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The History of Microsoft N/W OS

- **Windows NT 3.1 released in 1993**

- **Windows NT 3.5 released in 1994**

- **Windows NT 4.0 released in 1996**

- **Windows NT 5.0 was renamed as Windows 2000**

- **Windows .NET Server was renamed as Windows 2003**

- **Windows Server 2008**

- **Windows Server 2012**

OPERATING SYSTEM

Operating System

- An operating system is a software program that enables the computer hardware to communicate and operate with the computer software.

- Two types of Operating Systems

  Client OS

   Example-Windows Xp, Vista, Windows 7, Windows 8

  Server OS

   Example-Windows 2003, 2008, 2012

Tower Server

Rack Server

Blade Server

MICROSOFT WINDOWS SERVER 2008

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Microsoft
Windows Server 2008
Standard Edition

Microsoft
Windows Server 2008
Enterprise Edition

Microsoft
Windows Server 2008
Data Center Edition

MICROSOFT WINDOWS SERVER 2012

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Microsoft
Windows Server 2012
Foundation Edition

Microsoft
Windows Server 2012
Essentials Edition

Microsoft
Windows Server 2012
Standard Edition

Microsoft
Windows Server 2012
Data Center Edition

Windows Server 2012 Editions

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- **Foundation Edition:**
  - **Available only for OEM**
  - **License limited to 15 user accounts .**

- **Essentials Edition:**
  - **License limited to 25 user accounts.**

- **Standard Edition:**
  - **Full Windows Server functionality with two virtual instances .**

- **Data Centre Edition:**
  - **Full Windows Server functionality with unlimited virtual instances.**

Component	Requirement
Processor	Minimum: **1 processor with 1.4 GHz. {(X64) 64bit processor}** Maximum: **64 processors.** Note: **Hyper –V Compatible Processor is recommended for Standard and Data Center Editions.** **Intel VT or AMD – V.**
Memory	Minimum: **512 MB RAM** Maximum: **4 TB RAM**
Available Disk Space	Minimum: **10 GB** Recommended: **80 GB or greater**
Drive	**DVD-ROM drive**

- **64 Bit operating System**
- **Easy Installation**
- **Cloud Infrastructure**
- **Improved Server Manager**
  — **Customized Dash Board.**
  — **Remote Management of Server Core and Full.**
- **Active Directory**
  — **Administrative Center and Recycle Bin.**
  — **Domain Services.**
  — **Federation Services and Lightweight Directory Services.**
  — **Certificate Services and Rights Management Services.**

- In-built GPMC
- Centralized deployment of applications
- Disk Quotas
- Distributed File System
- Windows Server Backup
- DNS Dependency
- Internet Information services
- Improved Virtualization Features
  — Live Migrations of Virtual Machines and Storage.
  — Hyper – V Replica.
  — Dynamic Memory.

Features of Windows Server 2012

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- Enhanced Windows Deployment Services
  — Deploy OS with or without Active Directory.
- Windows Server Core
  — Anytime Conversion from Core to Full and Vice – Versa.
- Network Access protection
- Improved DHCP Server
  — Failover DHCP Server
  — Split Scope
- Improved Security
  — Kerberos Version5
  — Internet Protocol Security.

- Benefits of Server Core
- ➤ Greater stability
- ➤ Simplified management
- ➤ Reduced maintenance
- ➤ Reduced memory and disk requirements
- ➤ Reduced attack surface

IP ADRESSING

- **Two Versions of Addressing Scheme**

  - **IP version 4 – 32 bit addressing**

  - **IP version 6 – 128 bit addressing**

- **Total IP Addressing Scheme is divided into 5 Classes**

  - **CLASS A**

  - **CLASS B**   **LAN & WAN**

  - **CLASS C**

  - **CLASS D**   **Multicasting**

  - **CLASS E**   **Research & Development**

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- **CLASS A Range**
  - **0.0.0.0 - 127.255.255.255**
- **CLASS B Range**
  - **128.0.0.0 - 191.255.255.255**
- **CLASS C Range**
  - **192.0.0.0 - 223.255.255.255**
- **CLASS D Range**
  - **224.0.0.0 - 239.255.255.255**
- **CLASS E Range**
  - **240.0.0.0 - 255.255.255.255**

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- **IP address is divided into Network & Host Portion**
  - **CLASS A is written as**   **N.H.H.H**
  - **CLASS B is written as**   **N.N.H.H**
  - **CLASS C is written as**   **N.N.N.H**

- **Private IP Address**
    - **CLASS A**   **10.0.0.0**   -   **10.255.255.255**
    - **CLASS B**   **172.16.0.0** -   **172.31.255.255**
    - **CLASS C**   **192.168.0.0** -   **192.168.255.255**
- **Public IP Address**
    - **Apart from the above specified IP addresses all other IP addresses are   Public IP's**

```
Microsoft Windows [Version 6.2.92000]
(C) 2012 Microsoft Corporation. All rights reserved.

C:\Users \Administrator> Netsh interface ipv4 set address name="Ethernet"
source=static addr=10.0.0.1 mask=255.0.0.0

C:\Users\Administrator>
```

Assigning IP address via Powershell

```
Administrator: Windows PowerShell                                    _ □ ✕

Windows PowerShell
Copyright (C) 2012 Microsoft Corporation. All rights reserved.

PS C:\Users\Administrator>  Set-NetIPAddress -InterfaceAlias "Ethernet"
-IPAddress 10.0.0.1  -PrefixLength 24

PS C:\Users\Administrator>
```

Logical Topologies

- **Workgroup Model or Peer-To-Peer Model**

- **Domain Model or Client/Server Model**

IN A WORKGROUP MODEL

- All computers are peers; no computer has control over another computer.

- Each computer has a set of user accounts. To use any computer in the workgroup, you must have an account on that computer

IN A DOMAIN MODEL

- One or more computers are servers. Network administrators use servers to control the security and permissions for all computers on the domain. This makes it easy to make changes because the changes are automatically made to all computers.

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Windows 2012

CENTRALIZED USER DATABASE	
user1	****
user2	****
user3	****

Computer1

Windows XP

Computer2

Windows 8

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M C S E
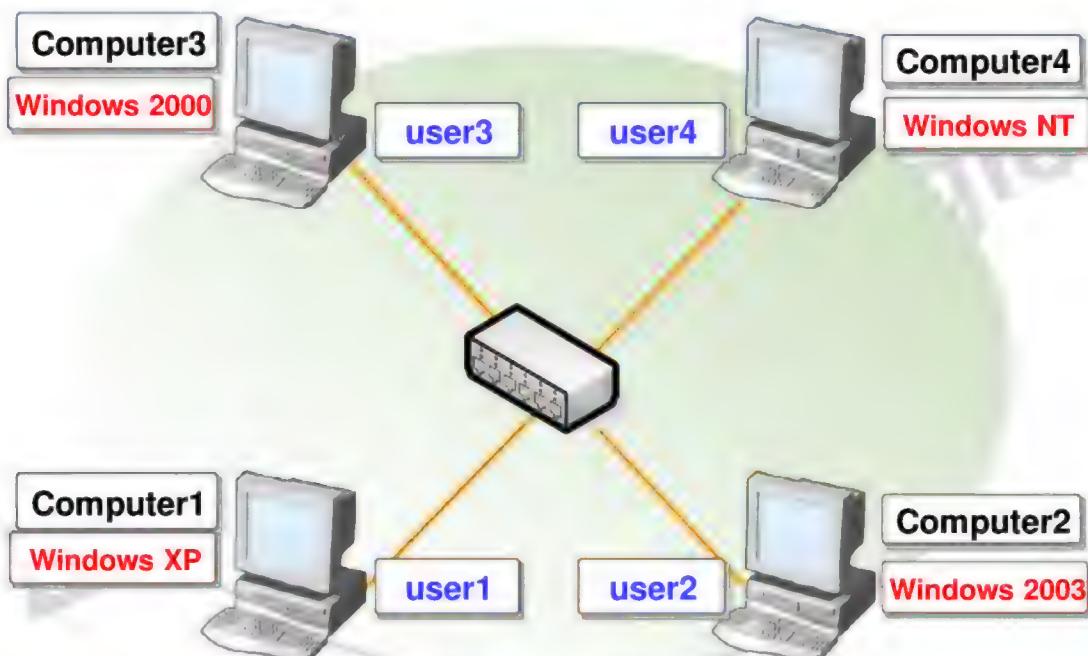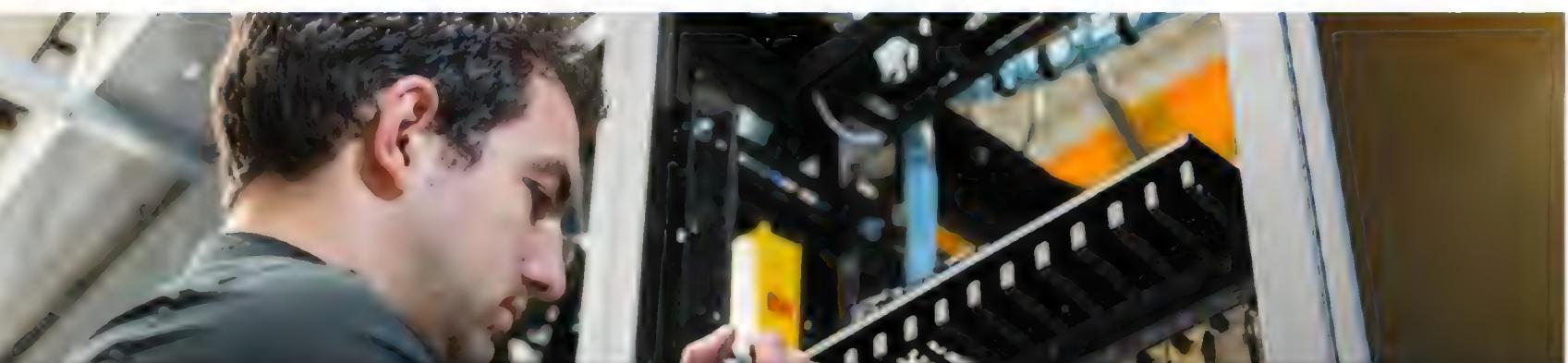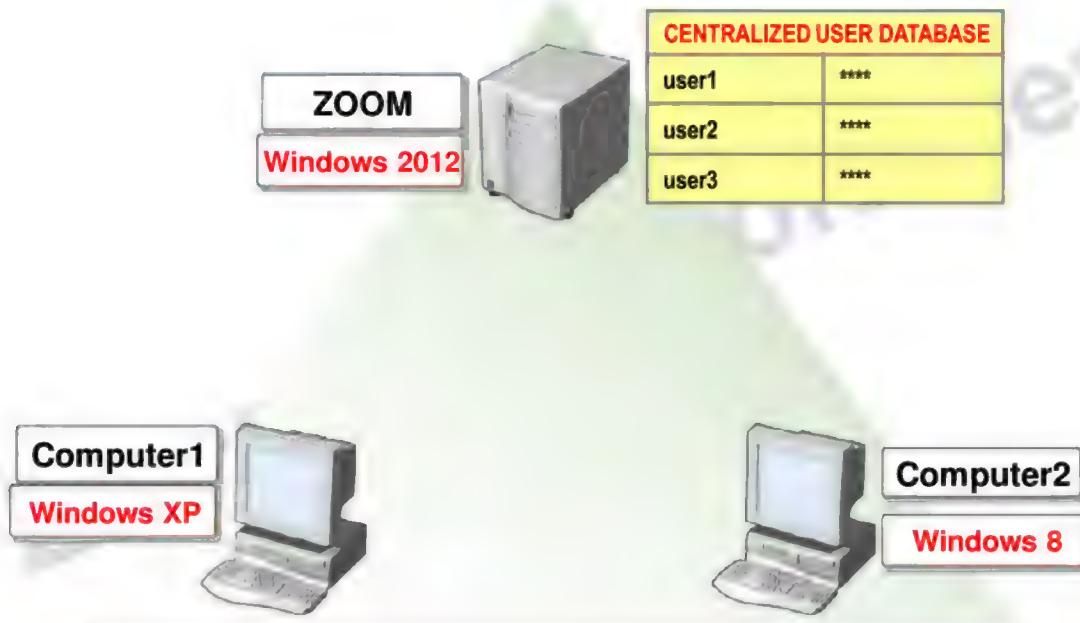
ACTIVE DIRECTORY DOMAIN SERVICES

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- The AD DS database stores information on user identity, computers, groups, services and resources.

- AD DS domain controllers also host the service that authenticates user and computer accounts when they log on to the domain

Active Directory DS

- Provides User Logon and Authentication Services using Kerberos protocol.

- To Centralize and Decentralize the resource management.

- To centrally organize and manage:

  — User Accounts, Computers, Groups, Network Resources.

- Enables authorized Users to easily locate Network Resources.

- Domain is a logical grouping of user, computer, and group objects for the purpose of management and security.

- Creating the initial domain controller in a network also creates the domain—you cannot have a domain without at least one domain controller.

- Each domain is identified by a DNS domain name.

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- A domain controller is a server that is configured to store a copy of the AD DS directory database (NTDS.DIT) and a copy of the SYSVOL folder.

- All domain controllers except RODCs store a read/write copy of both NTDS.DIT and the SYSVOL folder.

- NTDS.DIT is the database itself, and the SYSVOL folder contains all the template settings for GPOs.

- Domain controllers host several other Active Directory–related services, including the Kerberos authentication service and the Key Distribution Center (KDC).

- Kerberos authentication service is used by User and Computer accounts for logon authentication

- KDC is the service that issues the ticket-granting ticket (TGT) to an account that logs on to the AD DS domain.

---

1. User Account is authenticated to Domain Controller
2. Domain Controller returns TGT back to Client
3. Client uses TGT to apply for access to Workstation
4. Domain Controller grants access to Workstation
5. Client uses TGT to apply for access to Server
6. Domain Controller returns access to Server

Domain Controller

Work Station   Server
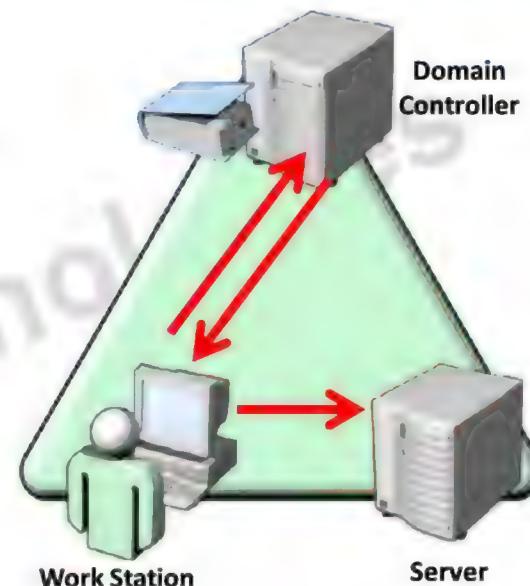
Clients & Member Servers

CLIENTS

- A computer joined in the domain with Client Operating system.
- Client Operating systems like
  - Windows 8, Windows 7, Windows XP professional . . .

MEMBER SERVERS

- A computer joined in the domain with Server Operating system.
- Server Operating systems like
  - Windows server 2012, Windows server 2008, Windows server 2003....

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WORKGRO
UP

Windows 2012   Windows 8

Windows 2008   Windows 7

Domain Controller

CLIENTS

MEMBER
SERVERS

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CLOUD
EXCHANGE
M C S E

USER MANAGEMENT

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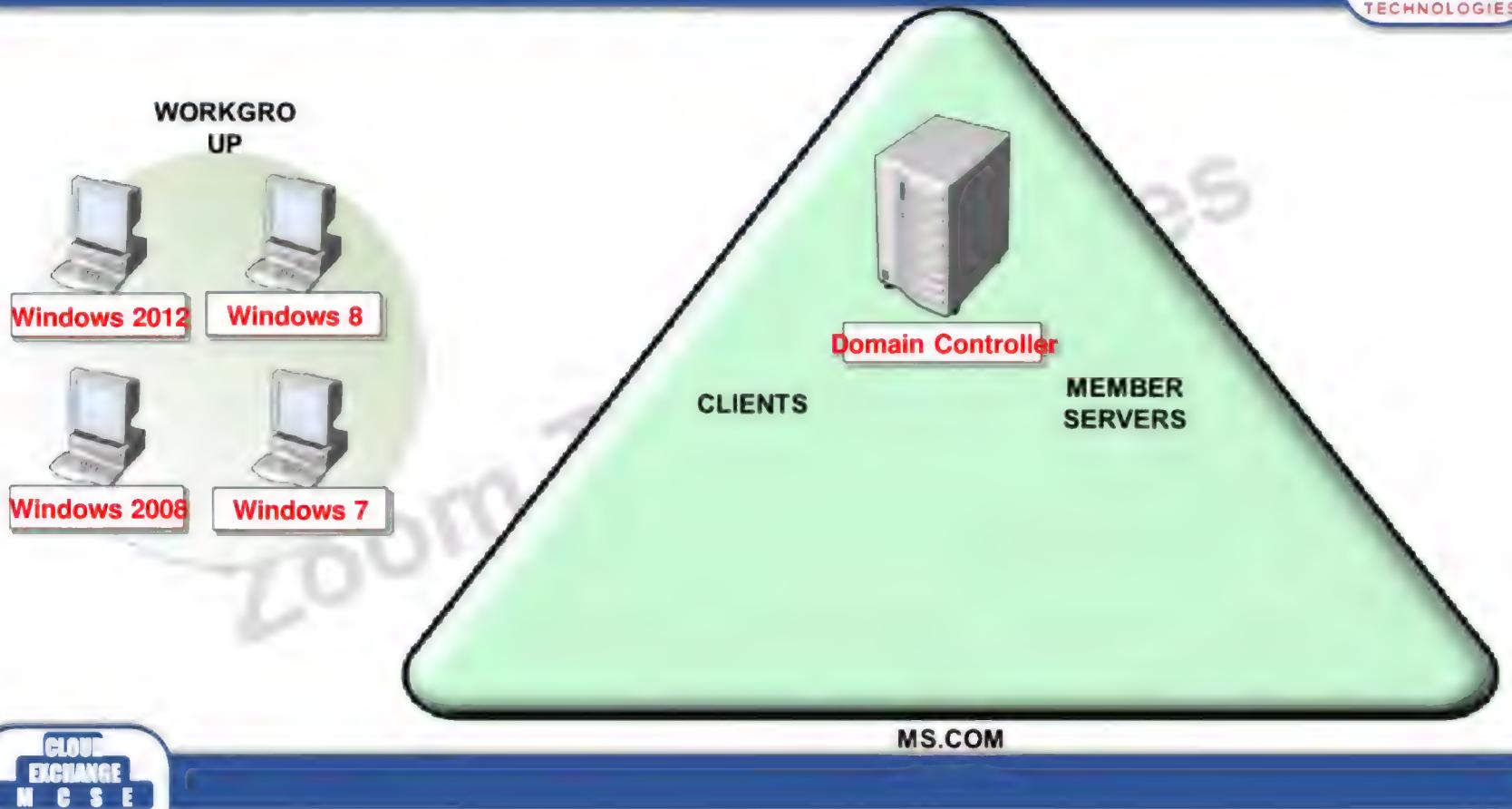
Local User

- A user account created in local database of a computer.
- Local users are generally used in WORKGROUP model.
- Local users can login only on the respective computer.

Domain User

- A user account created in ACTIVE DIRECTORY database.
- Domain users are used in DOMAIN model.
- Domain users can logon to any computer in the DOMAIN.

Command	Description
DSadd	Creates AD DS objects
Dsget	Displays properties of AD DS objects
Dsquery	Searches for AD DS objects.
DSmod	Modifies AD DS objects
DSrm	Removes AD DS objects
Dsmove	Moves AD DS objects

- **To modify the department of a user account, type:**

  Dsmod user "cn=vijay kumar, ou=users, dc=zoom, dc=com"   –dept IT

- **To display the email of a user account, type:**

  Dsget user "cn=vijay kumar, ou=users, dc=zoom, dc=com"   –email

- **To delete a user account, type:**

  Dsrm "cn=vijay kumar, ou=users, dc=zoom, dc=com"

- **To create a new user account, type:**

  Dsadd user "cn=vijay kumar, ou=users, dc=zoom,dc=com"

Cmdlet	Description
New-ADUser	Creates user accounts
Set-ADUser	Modifies properties of user accounts
Remove-ADUser	Deletes user accounts
Set-ADAccountPassword	Resets the password of a user account
Set-ADAccountExpiration	Modifies the expiration date of a user account
Unlock-ADAccount	Unlocks a user account after it has become locked after too many incorrect login attempts

- **To create a new user account with Department IT, type:**

    New-ADUser "Vijay Kumar" –AccountPassword (Read-Host –AsSecureString "Enter password") -Department IT
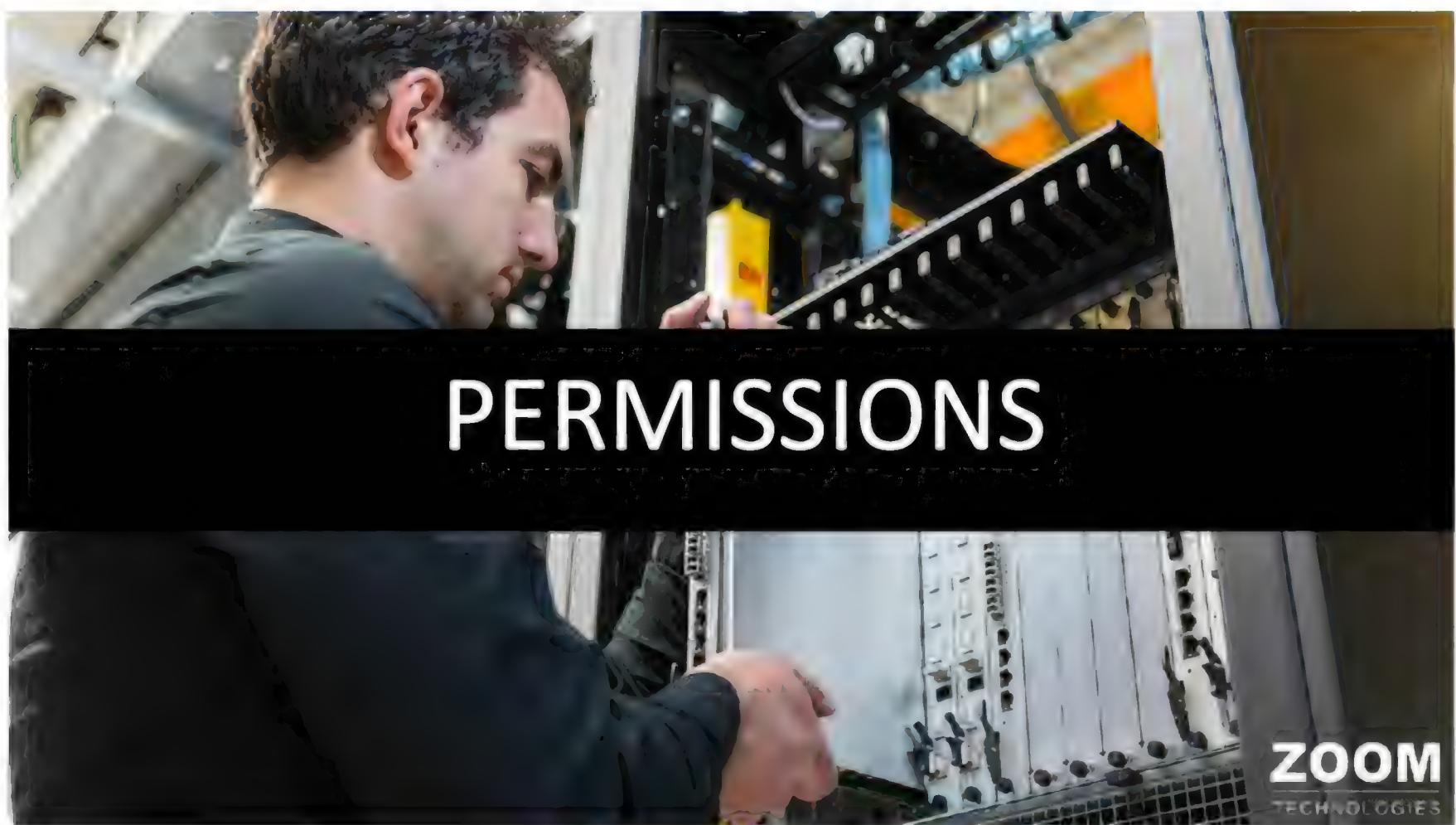
PERMISSIONS

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- **Permissions define the type of access granted to a user, group, or computer to access resources.**
- **Permissions can be applied to resources such as files, folders, and printers.**
  - **Like: Privilege to read a file, delete a file, or to create a new file in folder.**

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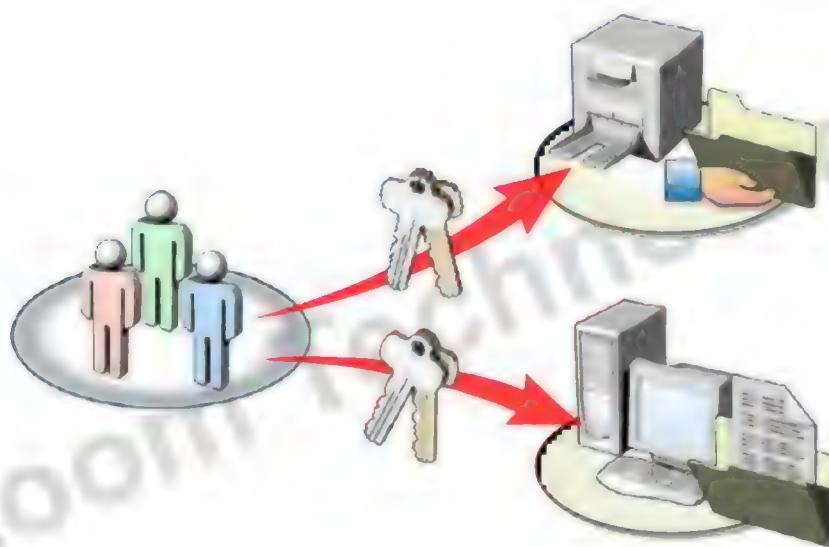
- **Security Level Permissions**
- **Share Level Permissions**

Security Level Permissions

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- **Can be Implemented Only on NTFS partitions.**
- **Security or NTFS Permissions can be set on Drives, Folders and Files.**
- **By default, Security permissions will be inherited from its parent drive or folder.**
- **File permissions override folder permissions.**
- **Creators of files and folders are their owners.**
- **Different Security Permissions are**
  - **Full Control, Modify, Read & Execute, Write, Read, List Folder Contents.**

- It can be implemented on NTFS and FAT partitions.
- It can be set on Drives and Shared Folders but not files.
- What are shared folders?
  - Shared folders can be accessed from network.
  - When you copy or move a shared folder, the folder will no longer be shared.
  - To hide a shared folder, include a $ after the name of the shared folder & users access hidden shared folders by typing the UNC path.
- Different Share Permissions are
  - Read, Read/Write.

- When you copy files and folders within the same partition or different partition they inherit the permissions of the destination folder.
- When you move files and folders to a different partition, they inherit the permissions of the destination folder
- When you move files and folders within the same partition, they retain their previous permissions.

NTFS Partition
C:\

Cop
y

Mov
e

NTFS Partition
D:\

Mov
e

NTFS Partition
E:\

Mov
e
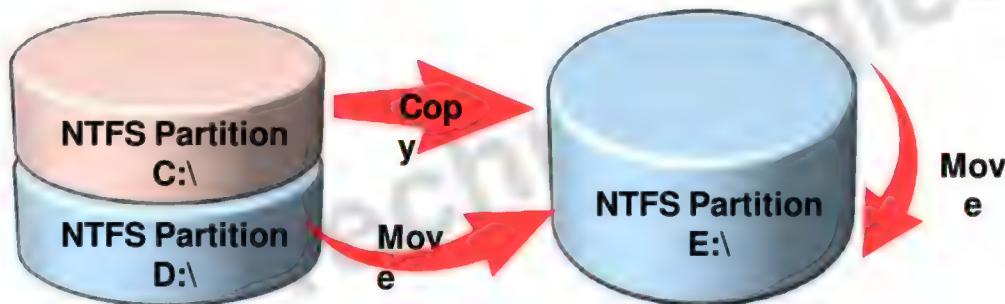
Access Based Enumeration (ABE)

- Access Based Enumeration displays only the files and folders that a user has permissions to access.

- If a user does not have read permissions for a folder, windows hides the folder from the users view.
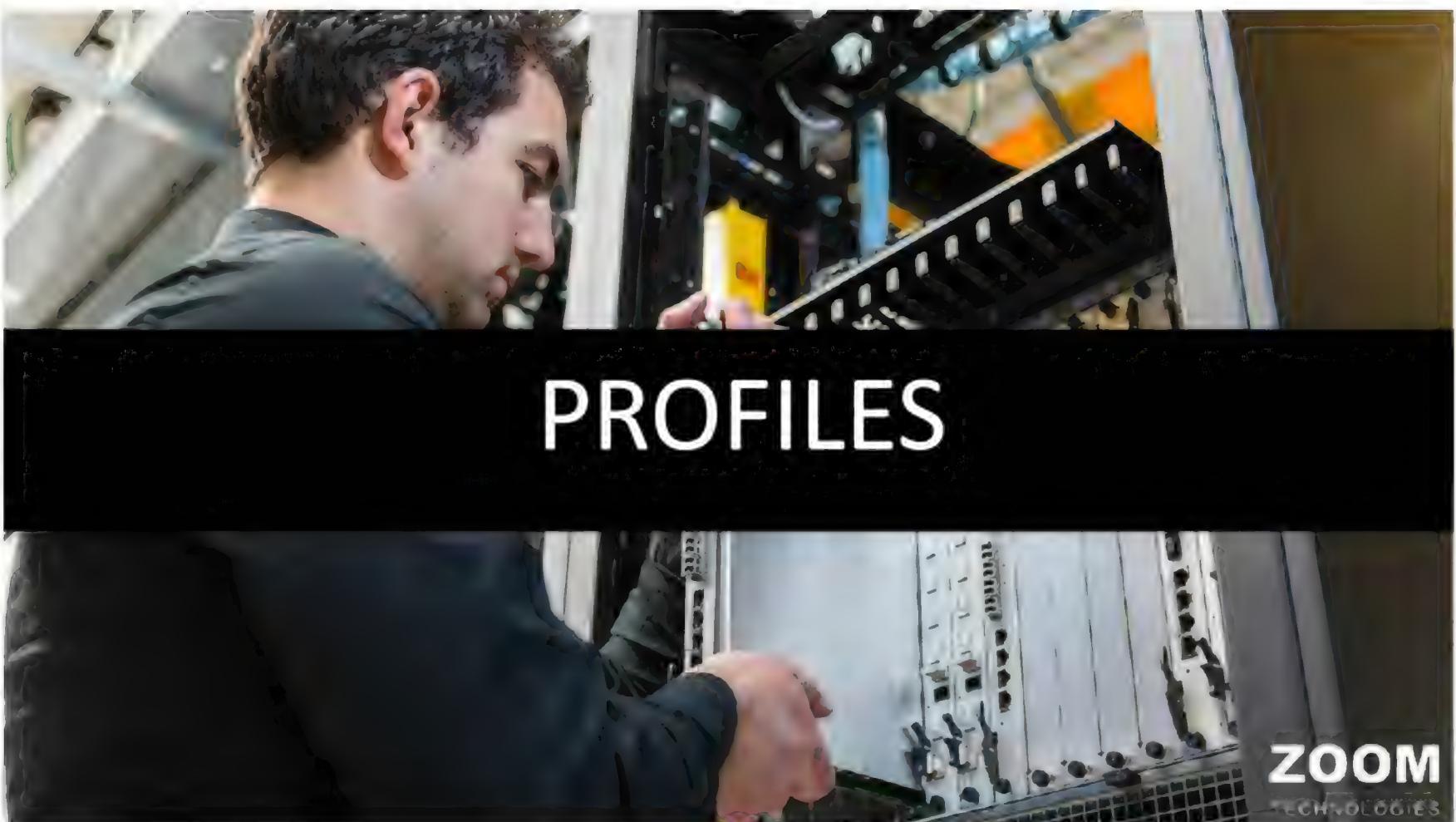
PROFILES

Profiles

- **Profile is a User-State Environment.**
- **Profile contains Personal Settings of the User like**
  - **Documents**
  - **Desktop Settings**
  - **Start Menu Icons**
  - **Shortcuts**
  - **Application Data**
  - **Downloads**
  - **Pictures, Music, Videos**
  - **Contacts**
  - **Favorites, etc**

- Local Profile
- Roaming Profile

- A local user profile is created the first time you log on to a computer and is stored on a computer's local hard disk.

- Any changes made to your local user profile are specific to the computer on which you made the changes.

Location of Local Profile

- In 2012, 2008, Windows 8, Windows 7, Windows Vista is C:\Users

- In 2003, 2000, NT, XP, 2000 Professional is C:\Documents & Settings.

Roaming Profile

- A roaming user profile is created by your system administrator and is stored on a server.
- This profile is available every time you log on to any computer on the network.
- Changes made to your roaming user profile are updated on the server.

Home Folder

- Home Folder is a centralized location of the users files (data)
- Home Folder make it easier for an administrator to back up user files by collecting all user's files in one location
- Whenever the user logs on to any computer in a domain, Home Folder will be available in the form of Network Drive / Network Location.

FILE SERVER RESOURCE MANAGER
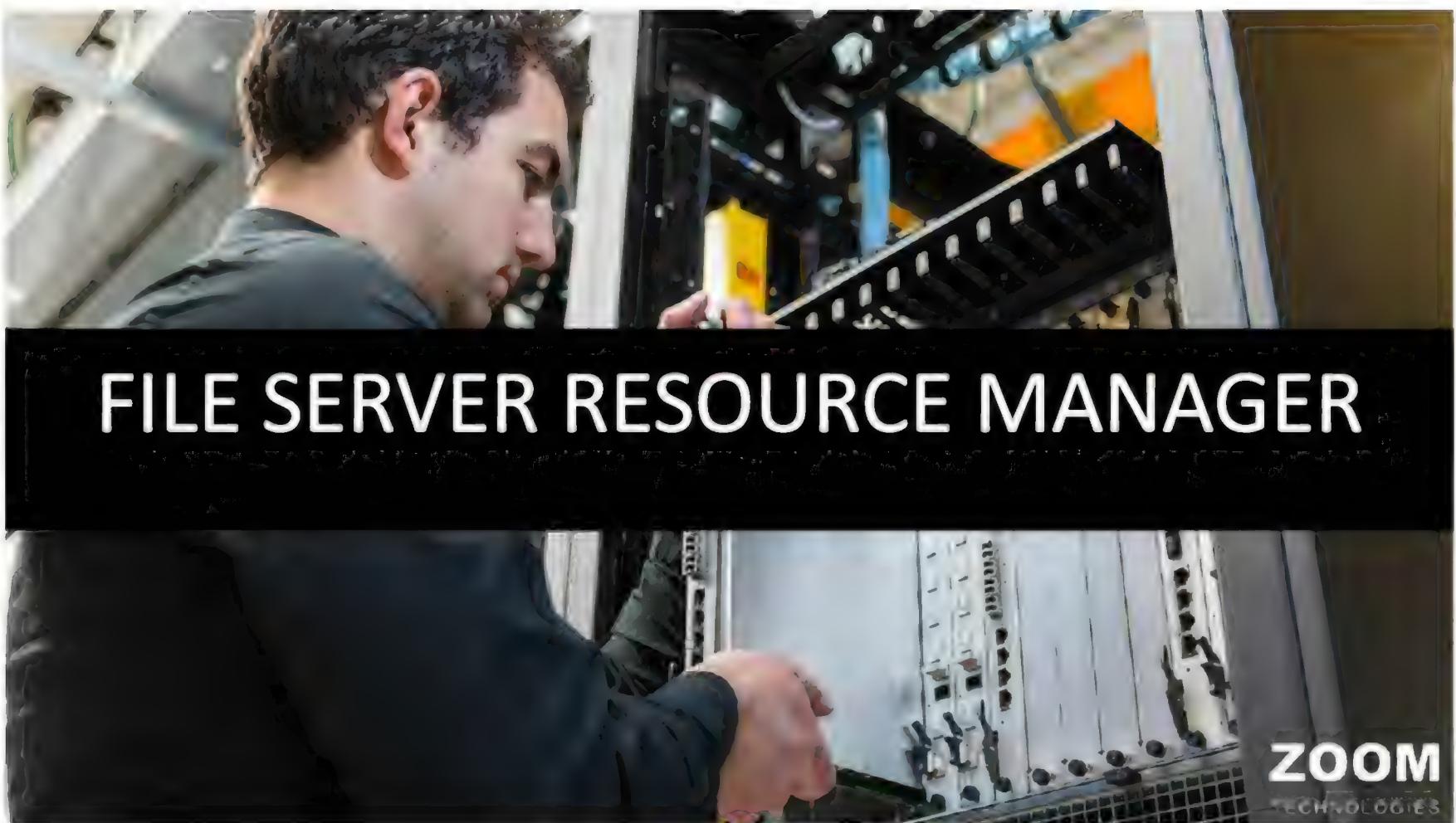
What Is FSRM?

- FSRM is intended to act as a capacity management solution for your Windows Server 2012 server.

- It provides a robust set of tools and capabilities that allow you to effectively manage and monitor your server's storage capacity.

- FSRM contains five components that work together to provide a capacity management solution

FSRM Functionality

- **Storage quota management**

- **File screening management**

- **Storage reports management**

What Is Quota Management?

- **Quota management is a component that allows you to create, manage, and obtain information about quotas that are used to set storage limits on volumes or folders (and its contents).**

- **By defining notification thresholds, you can send email notifications, log an event, run a command or script, or generate reports when users approach or exceed a quota.**

- **Quota management also allows you to create and manage quota templates to simplify the quota management process.**

- Quota management is used to limit disk space usage and provides notifications when thresholds are reached.

- Quota notifications can do any of the following:
    - Send email notifications
    - Log an event in Event Viewer
    - Run a command or script
    - Generate storage reports

- File screen management provides a method for controlling the types of files that can be saved on file servers.

- When users attempt to save unauthorized files, file screening can block the process and notify the administrators to allow for proactive management.

- Storage reports management is a component that allows you to schedule and configure storage reports about file usage on a file server.

- These reports provide information regarding following :

    - Quota usage.

    - File screening activity.

    - Files that may negatively affect capacity management, such as large files, duplicate files, or unused files.

    - List and filter files according to owner, file group, or a specific file property

ORGANIZATIONAL UNIT

Organizational Unit

- It is a logical container which contain active directory objects (Users, Groups, OU & other objects)

- It is also called as SUBTREE

- It is used for Minimizing administrative tasks

- It is used for organizing and managing the active directory objects

- It is used for delegating the control to one or more users.

What Is Delegation of Control ?

- The process of decentralizing management of organizational units.

- Assigning management of an organizational unit to another user or group

- Eases administration by distributing routine administrative tasks to another user or group.

Groups
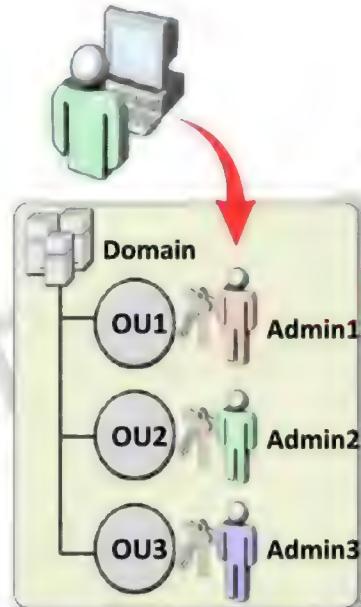
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- **It is an object of Active Directory used for applying Permissions and Distribution of emails to its members.**

  Two types of Groups

- **Security Group**

- **Distribution Group**

DISTRIBUTED FILE SYSTEM

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Sales1

Sales2

Client

User1
\\FS2\Sales2

FS1

FS2
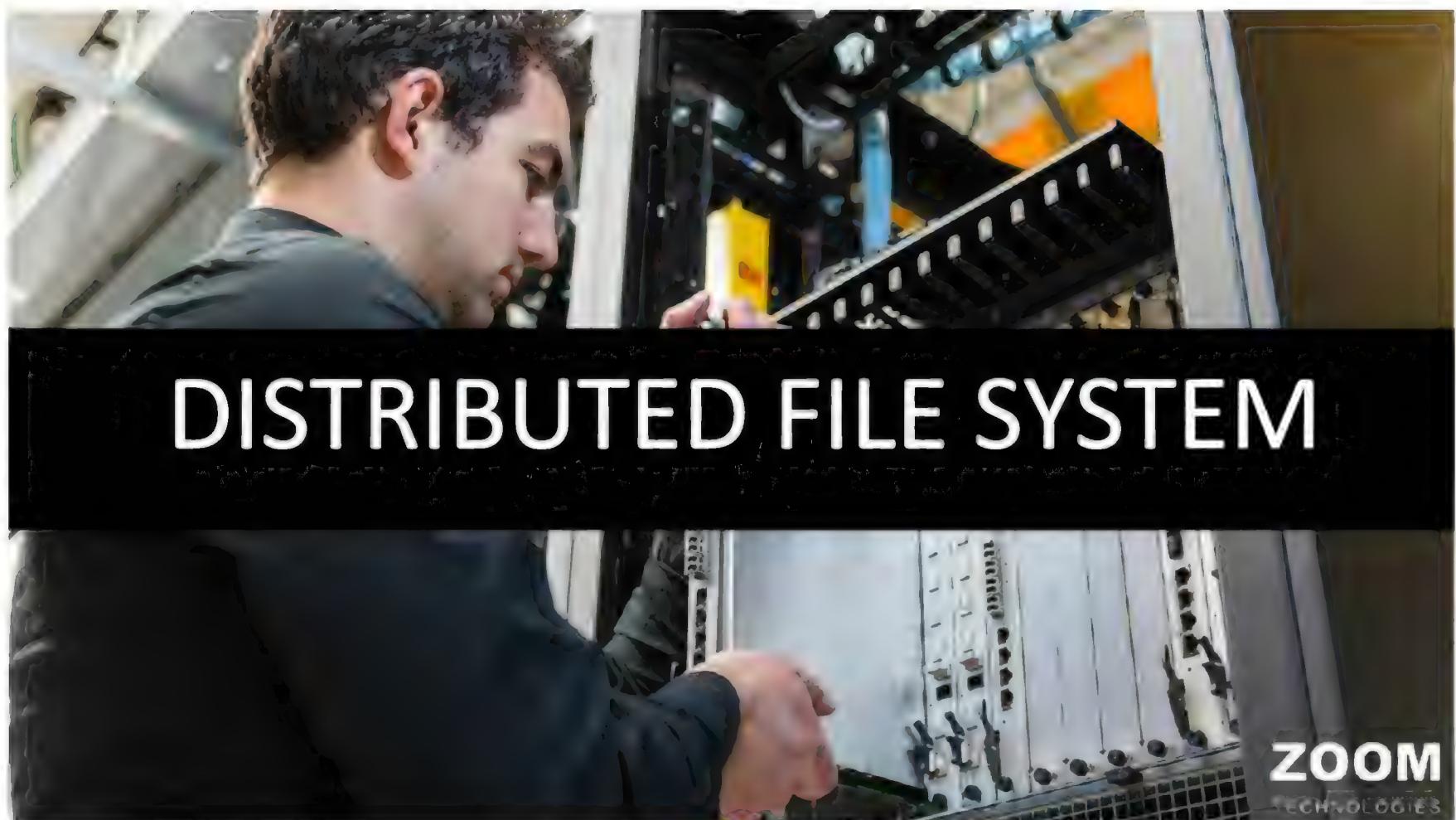
- DFS incorporates technologies that provide fault-tolerant access to geographically dispersed files.

- DFS namespaces enable a virtual representation of shared folder structures.

How DFS works?

SALES

Sales1

Sales2

ZOOM.COM

DFS SERVER

Sales1

Sales2

Client

FS1

FS2
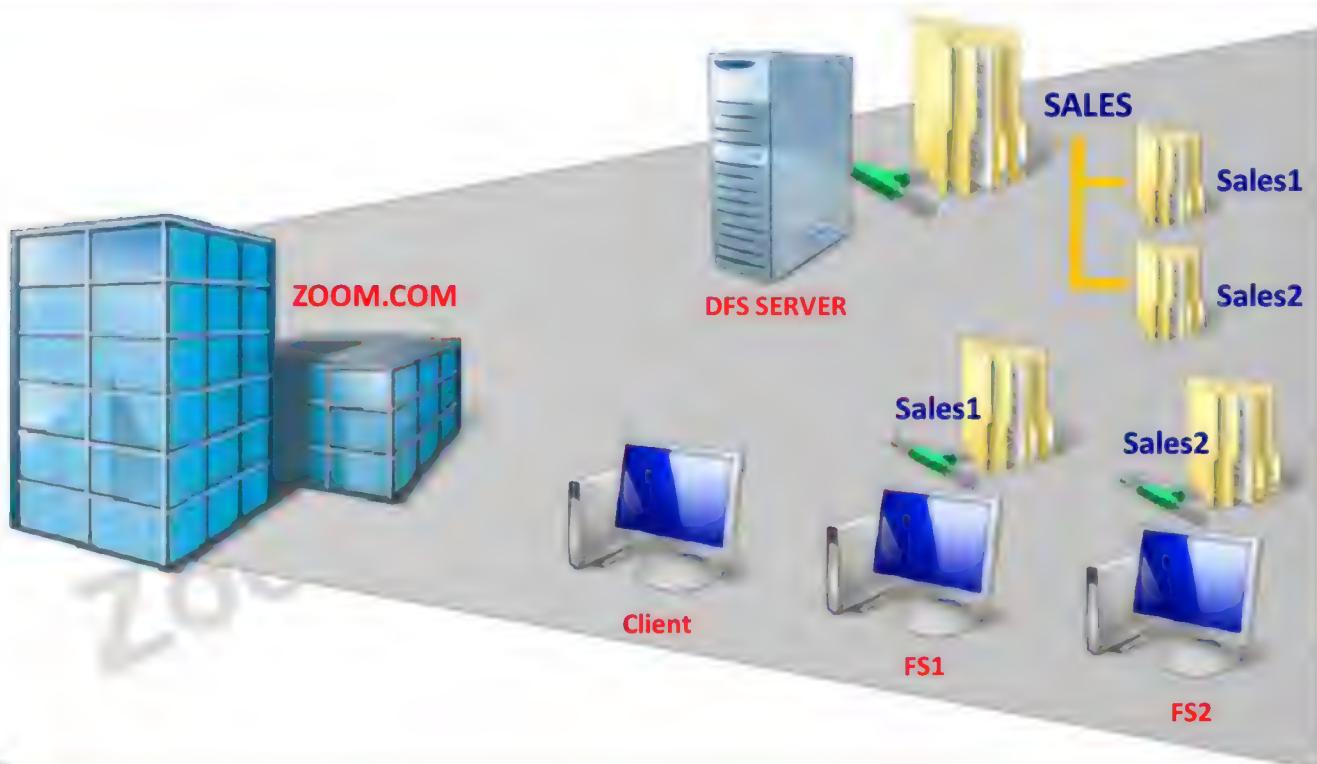
DFS Namespace (DFS-N)

- **Allows administrators to group shared folders that are located on different servers into one or more logically structured namespaces.**

- **Each namespace appears to users as a single shared folder with a series of subfolders. The subfolders typically point to shared folders that are located on various servers in multiple geographical sites throughout the organization.**

- A multimaster replication engine that synchronizes files between servers for local and WAN network connections.

- DFS Replication supports replication scheduling, bandwidth throttling, and uses remote differential compression (RDC) to update only the portions of files that have changed since the last replication.

- You can use DFS Replication in conjunction with DFS namespaces or as a standalone file replication mechanism.

ACTIVE DIRECTORY
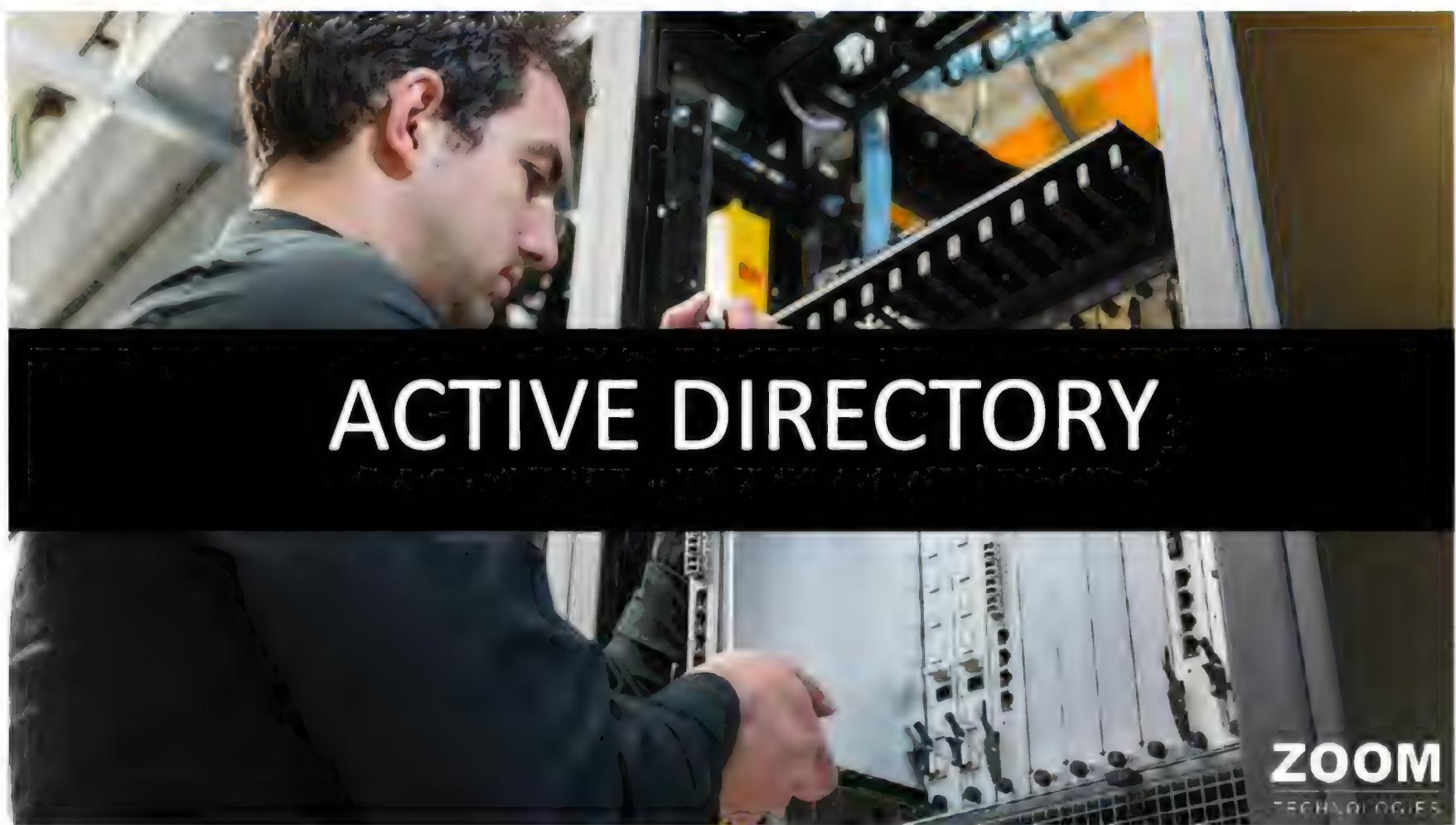
- If you already have one domain controller in a domain, you can add additional domain controllers to the domain to improve the availability and reliability of network services.

- Adding additional domain controllers can help provide fault tolerance, balance the load of existing domain controllers, and provide additional infrastructure support to sites.

- The replication type between two read/write dc's is multi master replication.

Tree

- Tree is a set of one or more domains with contiguous names.

- If more than one domain exists, you can combine the multiple domains into hierarchical tree structures.

- The first domain created is the root domain of the first tree.

- Other domains in the same domain tree are child domains.

- A domain immediately above another domain in the same domain tree is its parent.
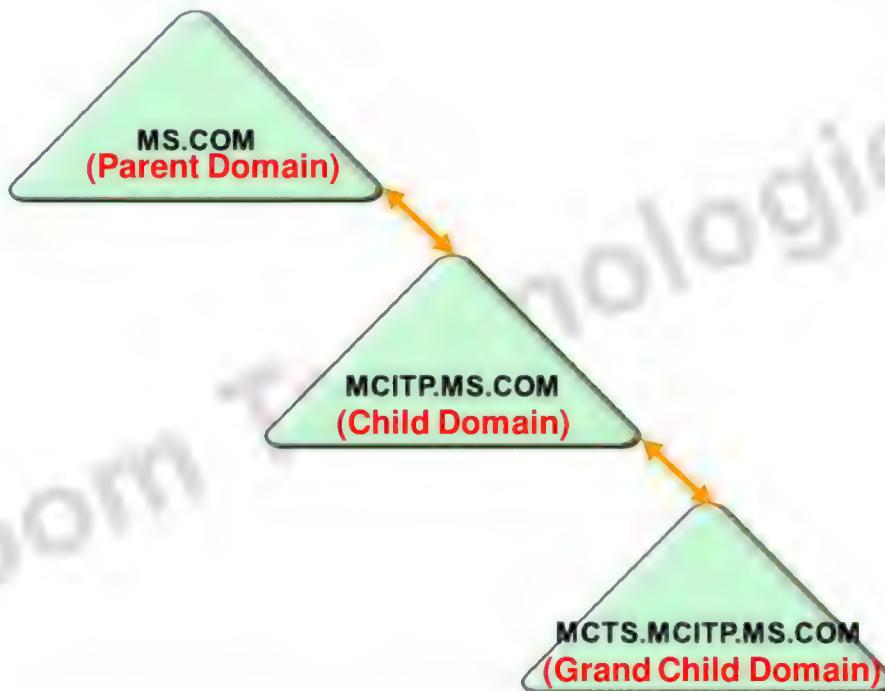
- Multiple domain trees within a single forest do not form a contiguous namespace.

- Although trees in a forest do not share a namespace, a forest will have a single root domain, called the forest root domain.

- The forest root domain is the first domain created in the forest.

- These two forest-wide predefined groups reside in forest root domain.

  - Enterprise Admins
 - Schema Admins

ACTIVE DIRECTORY
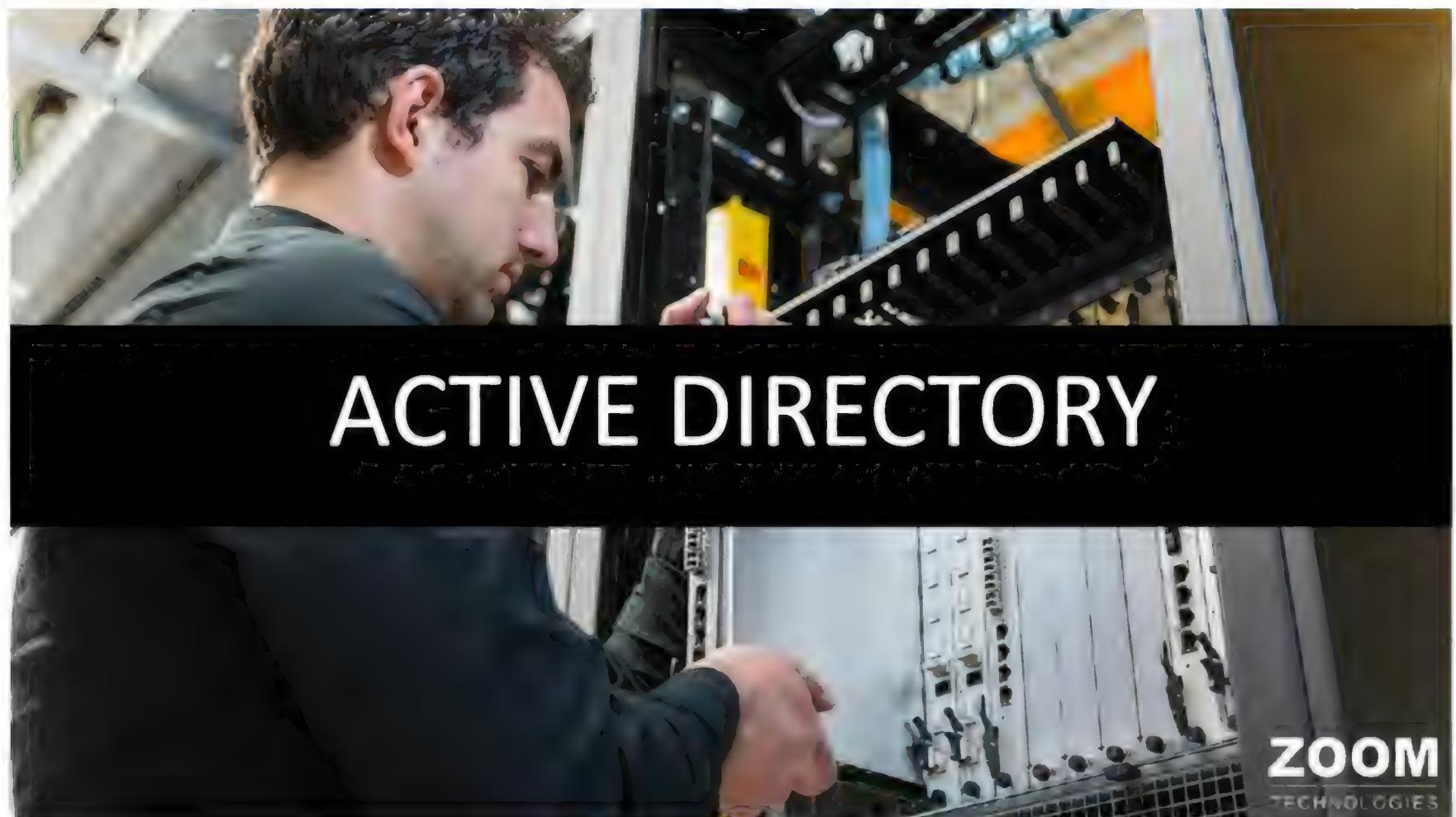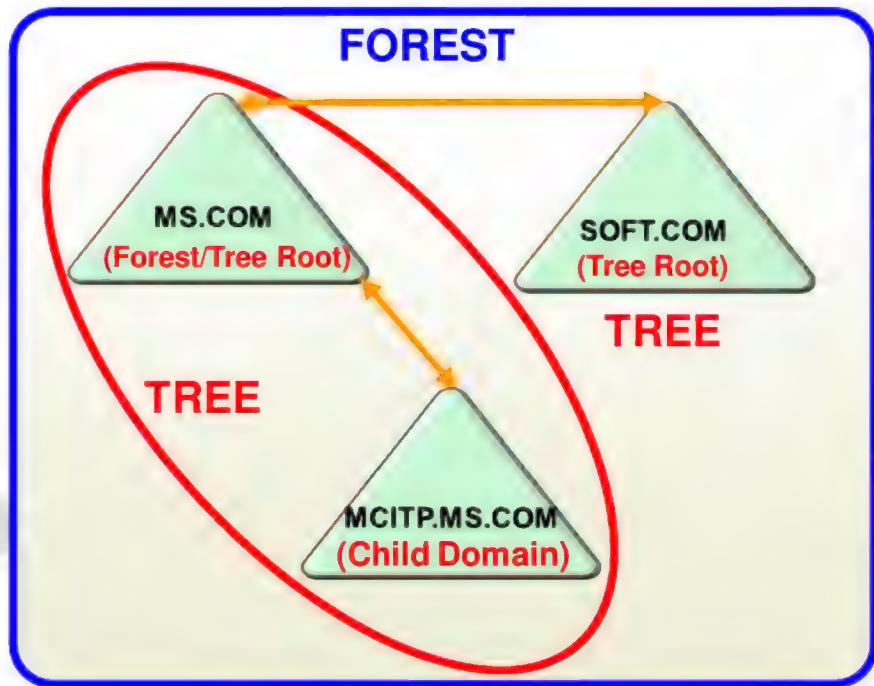
OPERATION MASTERS

- **Naming Master**

- **Schema Master**

- **RID Master**

- **PDC Emulator**

- **Infrastructure Master**

Flexible Single Master Operation Roles (FSMO Roles)

- **Global Catalog**

Multi Master Operations Role

- **Checks and Maintains the Uniqueness of the Domain Names in the Whole Forest.**

- **It is Responsible for Adding, Removing and Renaming the domain names in the whole Forest.**

Naming Master

New Domain
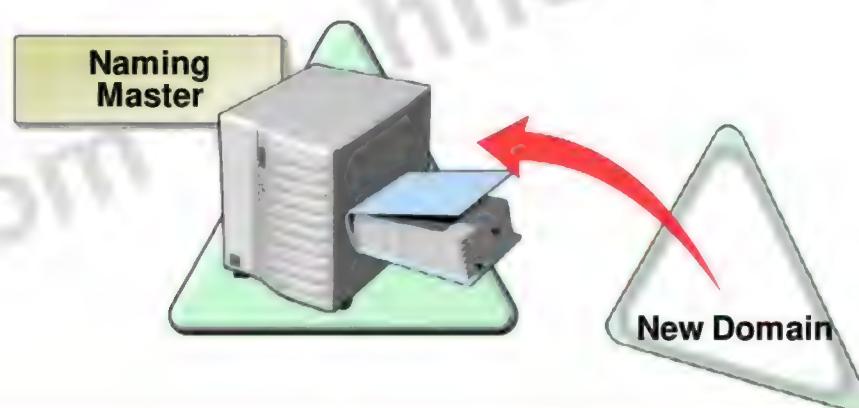
- Schema is a Set of Rules which is used to define the Structure of AD

- Schema contains Definitions of all the Objects which are stored in AD.

- Schema is further classified into:

  - **Classes**

    - Class is a Template which is used to Create an Object

  - **Attributes**

    - Attributes are Properties of an Object
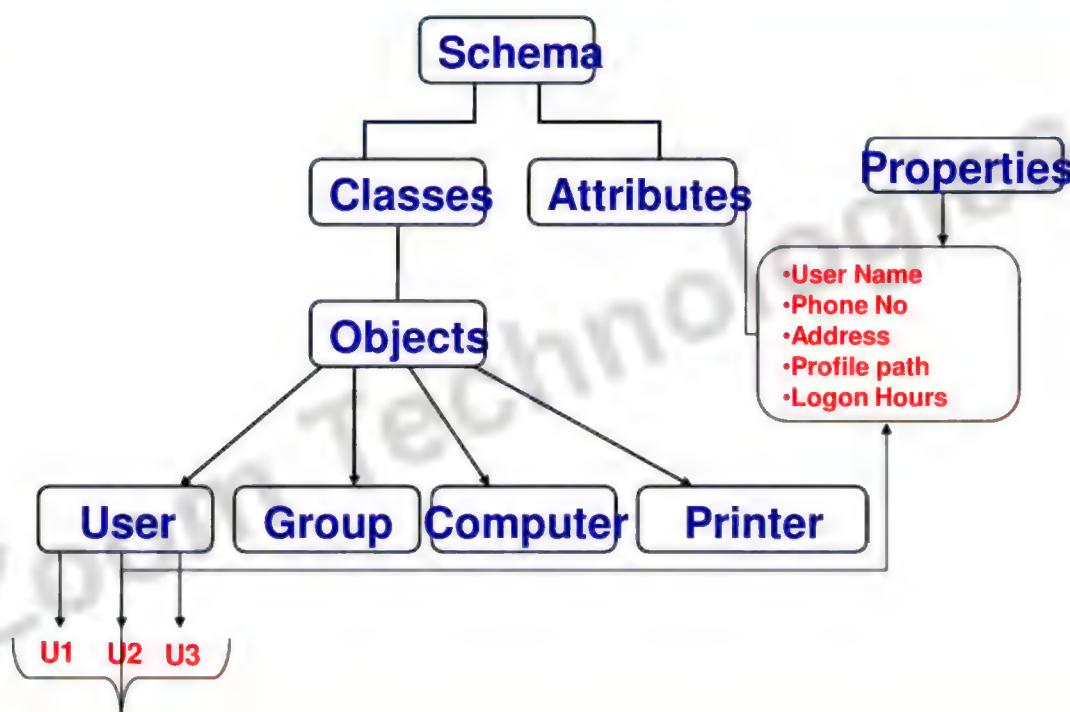
- The Schema Master role owner is the DC responsible for performing updates to the directory schema.

- This DC is the only one that can process updates to the directory schema. Once the schema update is complete, it is replicated from the Schema Master FSMO role owner to all other DCs in the directory.

- There is only one Schema Master per forest.

Roles of Active Directory

ZOOM TECHNOLOGIES

OPERATION MASTERS

- Naming Master

- Schema Master

Forest Wide
Roles

- It assigns unique IDs (RIDs) to the objects which are created in the domain

- Allocates pool of Relative IDs (RIDs) to all Domain controllers within a Domain.

$$SID = Domain\ ID + RID$$
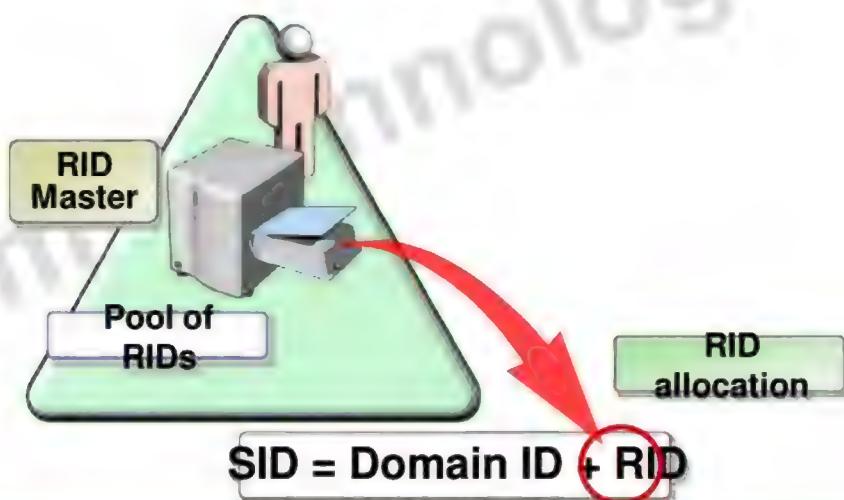
- Acts as a PDC for Windows NT 4.0 BDC's in the domain

- Processes all password updates for clients

- Receives immediate updates from other domain controllers when a user's password is changed

- It Synchronizes time between the Domain controllers with in the domain.

ZOOM
TECHNOLOGIES

- **Infrastructure Master Maintains and Updates the Universal Group Membership information**

- **It is Used for Inter-Domain Operations**

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Roles of Active Directory

ZOOM
TECHNOLOGIES

OPERATION MASTERS

- **Naming Master**

- **Schema Master**

Forest Wide Roles

- **RID Master**

- **PDC Emulator**

Domain Wide Roles

- **Infrastructure Master**

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GROUP POLICY

Group Policy

- **Group policy is a collection of settings which can be applied on computers and users.**

- **With group policy administrator can centrally manage the computers and users.**

- **Eases administration using group policy.**
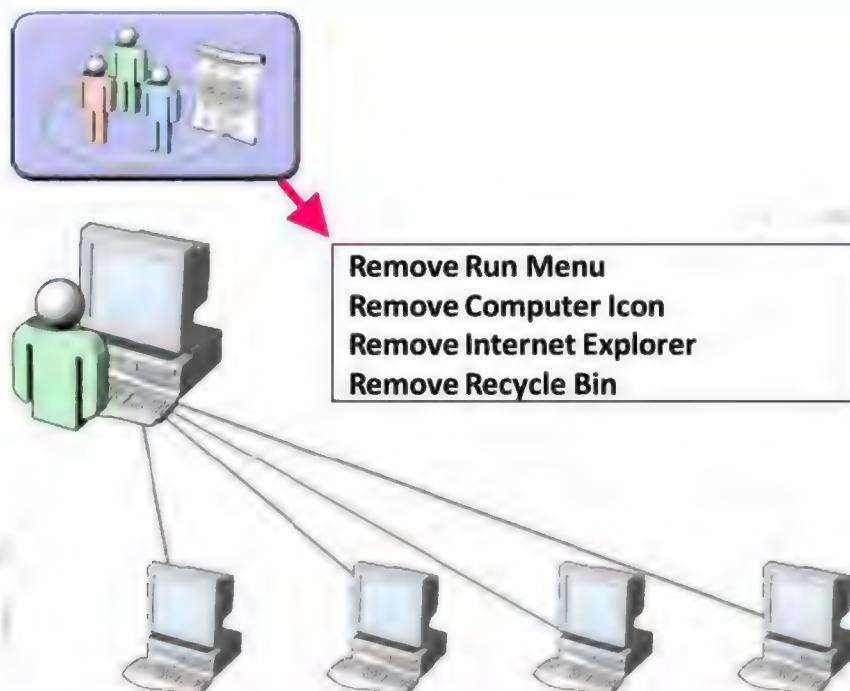
ZOOM
TECHNOLOGIES
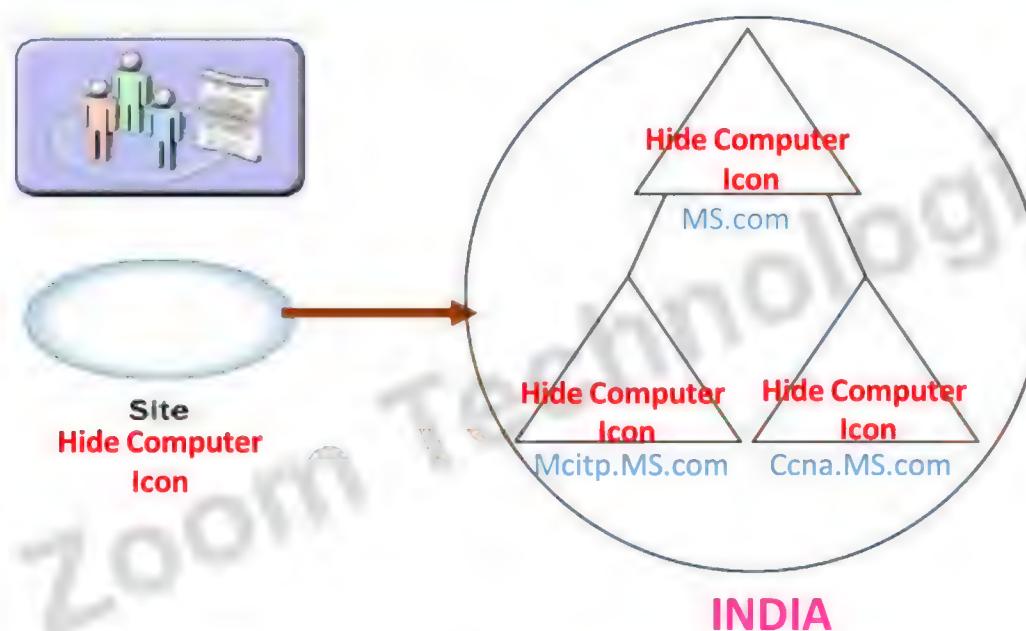
Desktop Settings

Computer Icon
Recycle Bin Icon
Internet Explorer

Allow or Deny

Hide or Show

Help
Search
Run Menu

Start Menu Settings

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M C S E

ZOOM
TECHNOLOGIES

Remove Run Menu
Remove Computer Icon
Remove Internet Explorer
Remove Recycle Bin

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M C S E

Site Group Policy

Domain

Hide Internet Explorer Icon

DC   ADC
Hide Internet Explorer Icon

Clients
MS.COM

Domain Group Policy

CLOUD
EXCHANGE
M C S E

Organizational Unit
Hide Recycle Bin Icon

Sys1   Sys2

Hide Recycle Bin Icon

OU Group Policy

CLOUD
EXCHANGE
M C S E
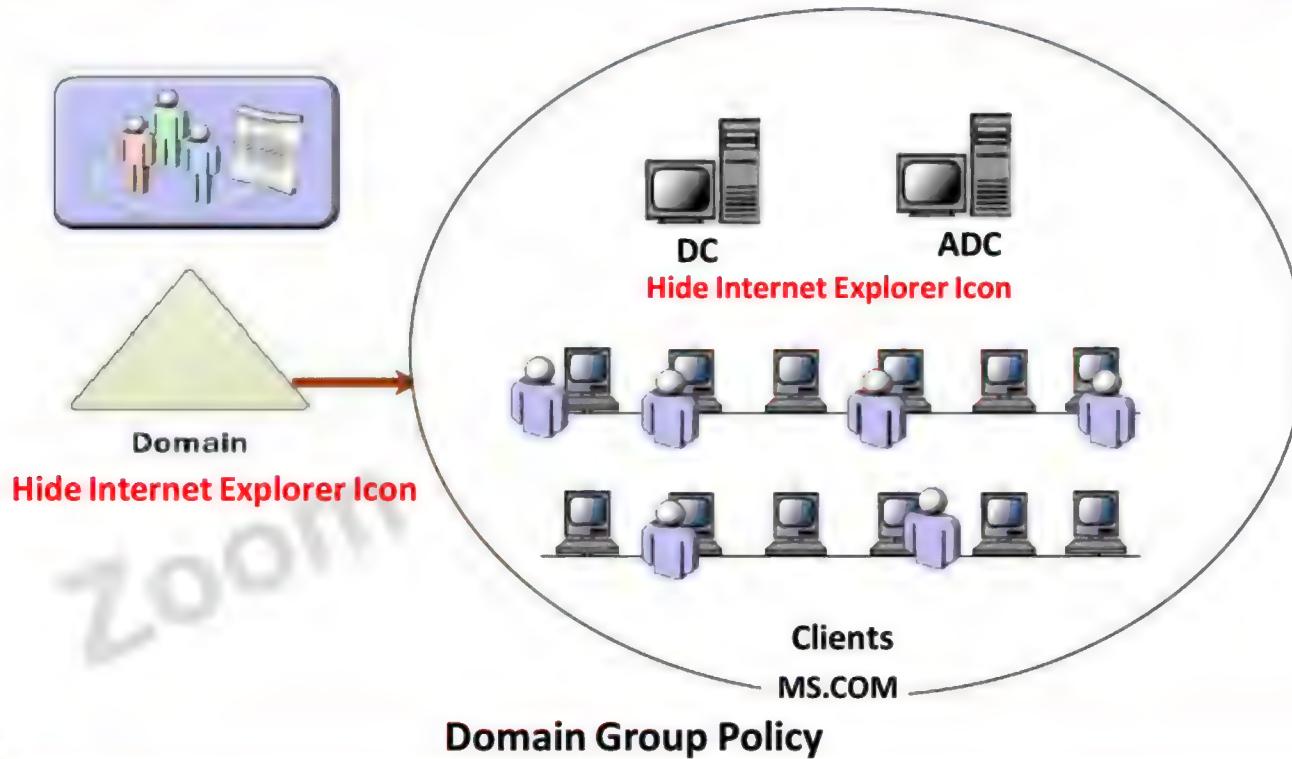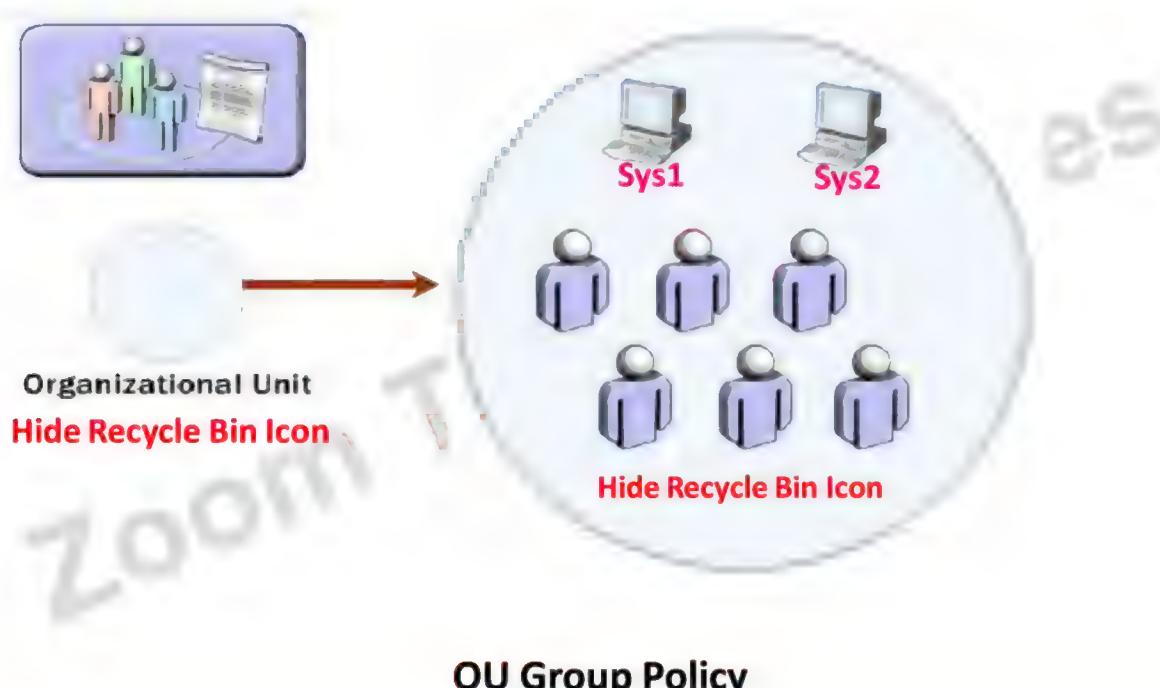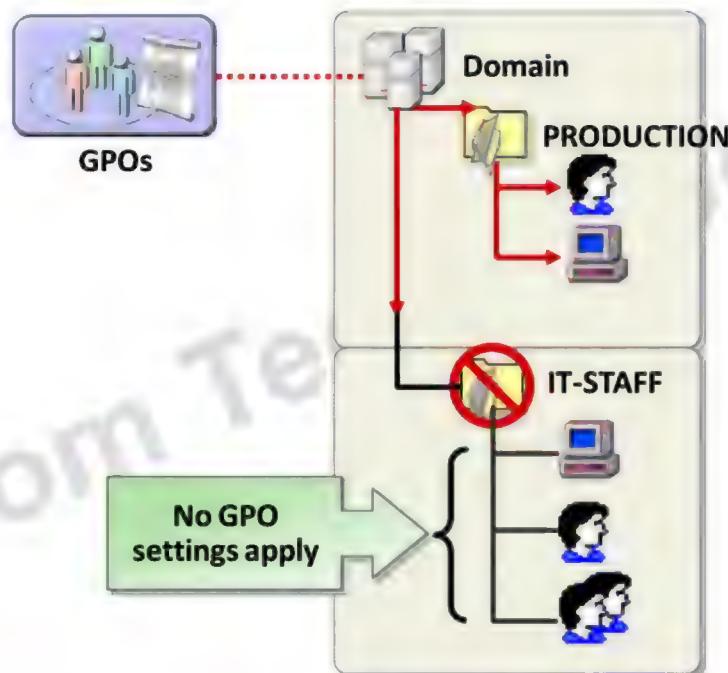
Software Deployment

- It is to deploy software (Applications) on all the computers in the domain from one central location by applying the Group Policies.

- Supports the deployment of ".MSI" but not ".EXE" applications.

Folder Redirection

- **Redirection of folders on the local computer or on a Shared folder.**

- **Folders on a server appear as if they are located on the local drive.**

- **Fastens the User logon process in case if the profile is large.**

Auditing

- **Audit policy configures a system to audit categories of activities. If audit policy is not enabled, a server will not audit those activities**

- **Audit events categories are as below :**
  - **Access to NTFS files and folders**
  - **Account or object changes in AD DS**
  - **Logon**
  - **Assignment of use of user rights**

- Group Policy preferences provide better targeting, through item-level targeting and action modes.

- Additionally, rich user interfaces and standards-based XML configurations provide you with more power and flexibility over managed computers when you administer GPOs.

- Examples of the new Group Policy preference extensions include folder options, mapped drives, printers, scheduled tasks, services, and Start menu settings.

ACTIVE DIRECTORY
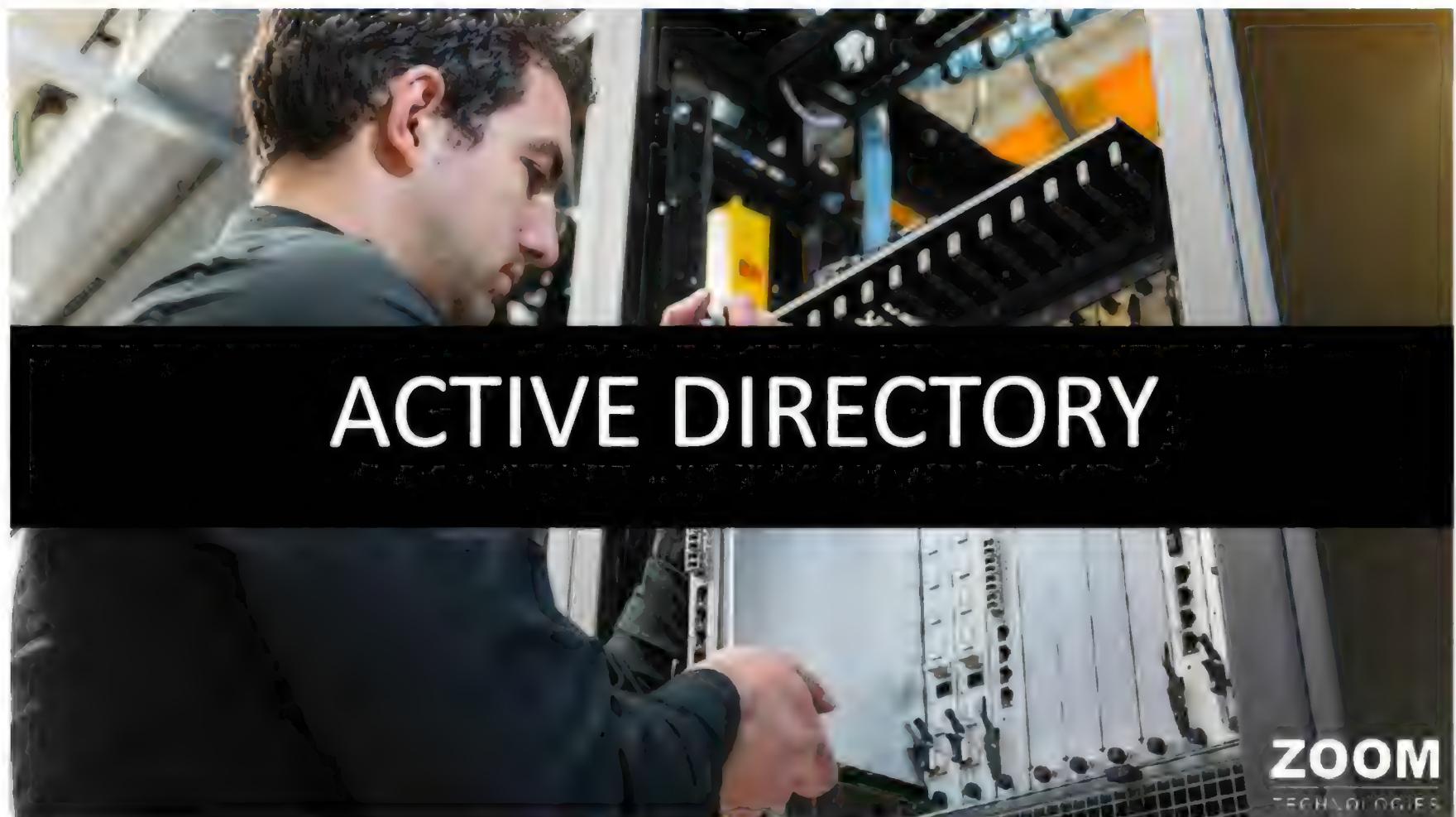
- Secure communication paths that allow objects in one domain to be authenticated and accepted in other domains

- Some trusts are automatically created.

  - Parent-child domains trust each other

  - Tree root domains trust forest root domain

- Other trusts are manually created

- Forest-to-Forest transitive trust relationships can be created in Windows Server 2003, 2008 and Windows server 2012 forests only.

Trust categories	• Transitive trusts • Nontransitive trusts
Trust directions	• One-way incoming trust • One-way outgoing trust • Two-way trust
Trust types	• Five types of trusts: Default, Shortcut, External, Forest and Realm

DEFAULT : Two-way- transitive Kerberos trusts (Intraforest)

SHORTCUT : One or two-way transitive Kerberos trusts (Intraforest) Reduce authentication requests

EXTERNAL : One way non-transitive NTLM trusts. Used to connect to/from Windows NT or external 2000 domains Manually created

FOREST : One or two-way transitive Kerberos trusts. Only between 2003,2008 or 2012 Forest Roots, Creates transitive domain relationship

REALM : One or two-way – non-transitive Kerberos trusts Connect to/from UNIX Kerberos realms

Transitive Trust

In this category,

If Domain A trust Domain B and Domain B trust Domain C then Domain A automatically trust Domain C
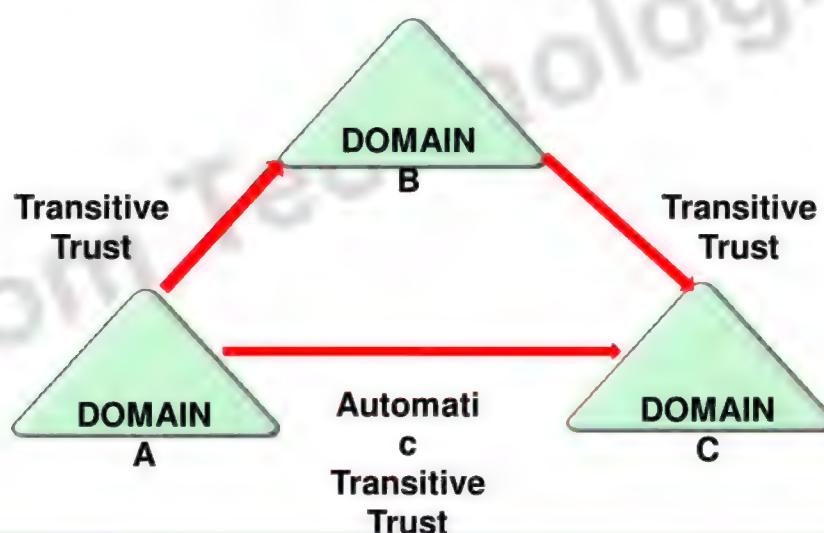
In this category,

If Domain A trust Domain B and Domain B trust Domain C then Domain A does not trust Domain C

DOMAIN B

Non-Transitive Trust

Transitive Trust

DOMAIN A

No Automatic Trust

DOMAIN C

SOFT.COM

MS.COM
Forest Root

NET.SOFT.COM

MCITP.MS.COM

CCNA.MS.COM

VB.NET.SOFT.COM

MCTS.MCITP.MS.COM
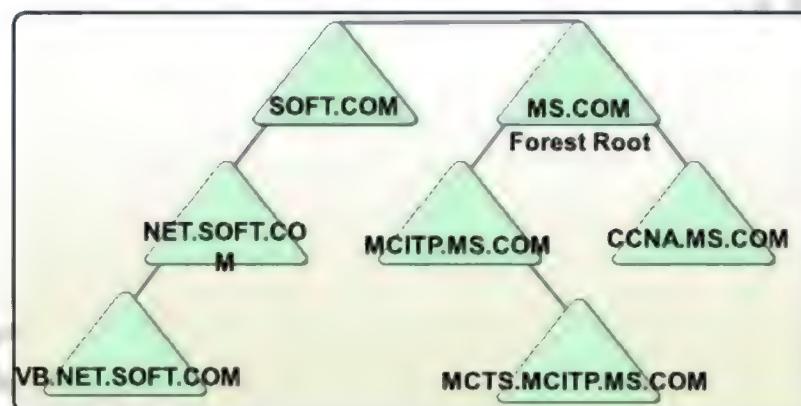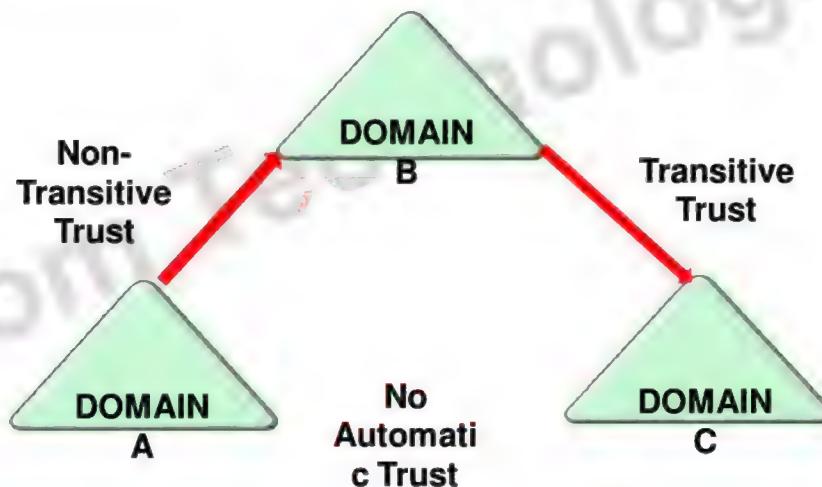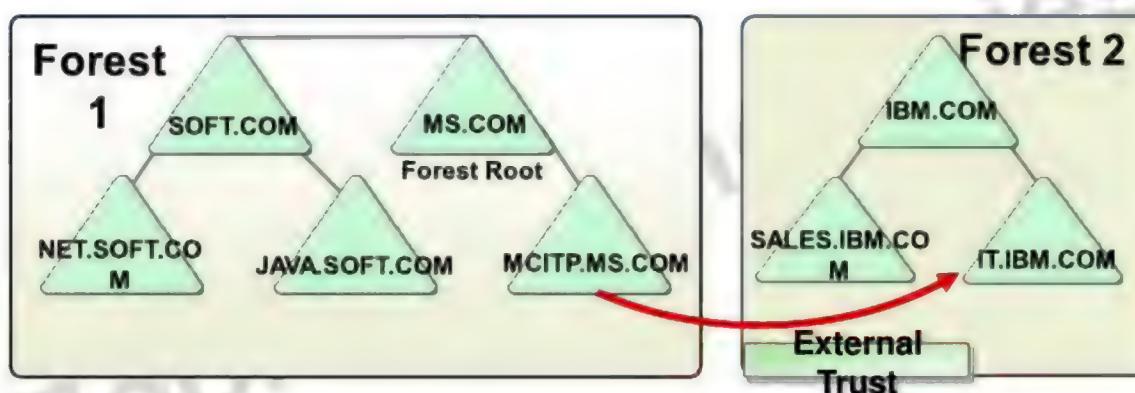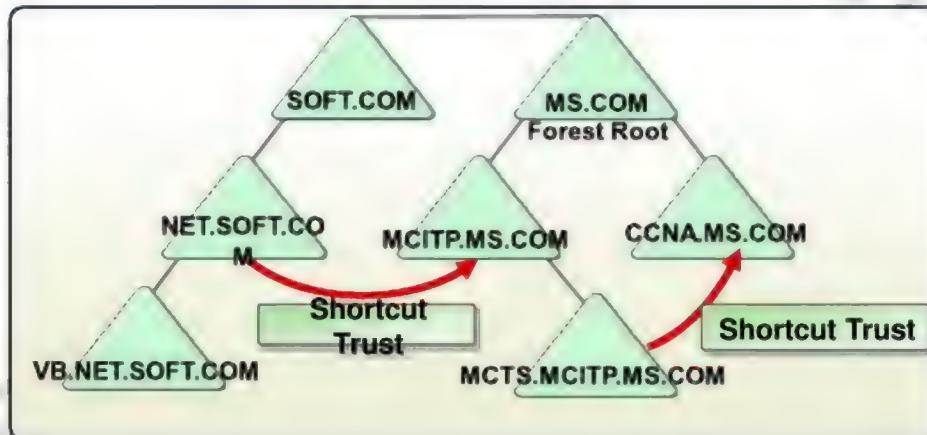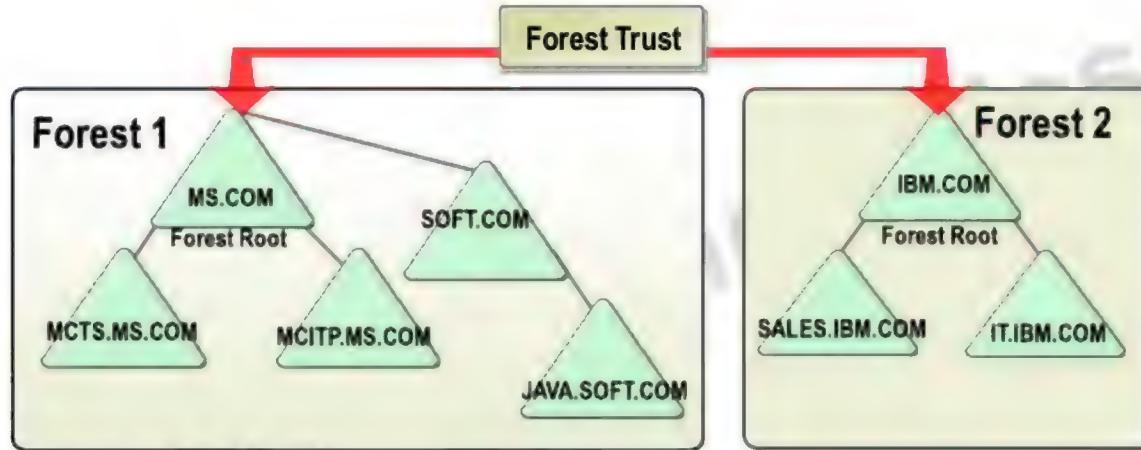
FUNCTIONAL LEVELS

Functional Levels

- **Functional levels determine**

  - **Supported domain controller operating system**

  - **Active Directory features will be available**

| Domain Functional Levels	Operating systems Supported on Domain controllers
Windows Server 2003	Windows Server 2003 OS, Windows Server 2008 OS, Windows Server 2008 R2 OS, Windows Server 2012 OS
Windows Server 2008	Windows Server 2008 OS, Windows Server 2008 R2 OS, Windows Server 2012 OS
Windows Server 2008 R2	Windows Server 2008 R2 OS, Windows Server 2012 OS
Windows Server 2012	Only Windows Server 2012 OS

Windows Server 2003 Mode-

Domain Controller (Windows Server 2012)

Domain Controller (Windows Server 2003)

Domain Controller (Windows Server 2008)

Domain controller (Windows Server 2008 R2)

Windows Server 2008 Mode-

Domain Controller (Windows Server 2012)

Domain Controller (Windows Server 2008)

Domain Controller (Windows Server 2008 R2)

Domain Functional Levels

Windows Server 2008 R2 Mode-

Domain Controller
(Windows Server 2012)

Domain Controller
(Windows Server
2008 R2)

Windows Server 2012 Mode-

Domain Controller
(Windows Server
2012)

Domain Controller
(Windows Server 2012)

Forest Functional Levels
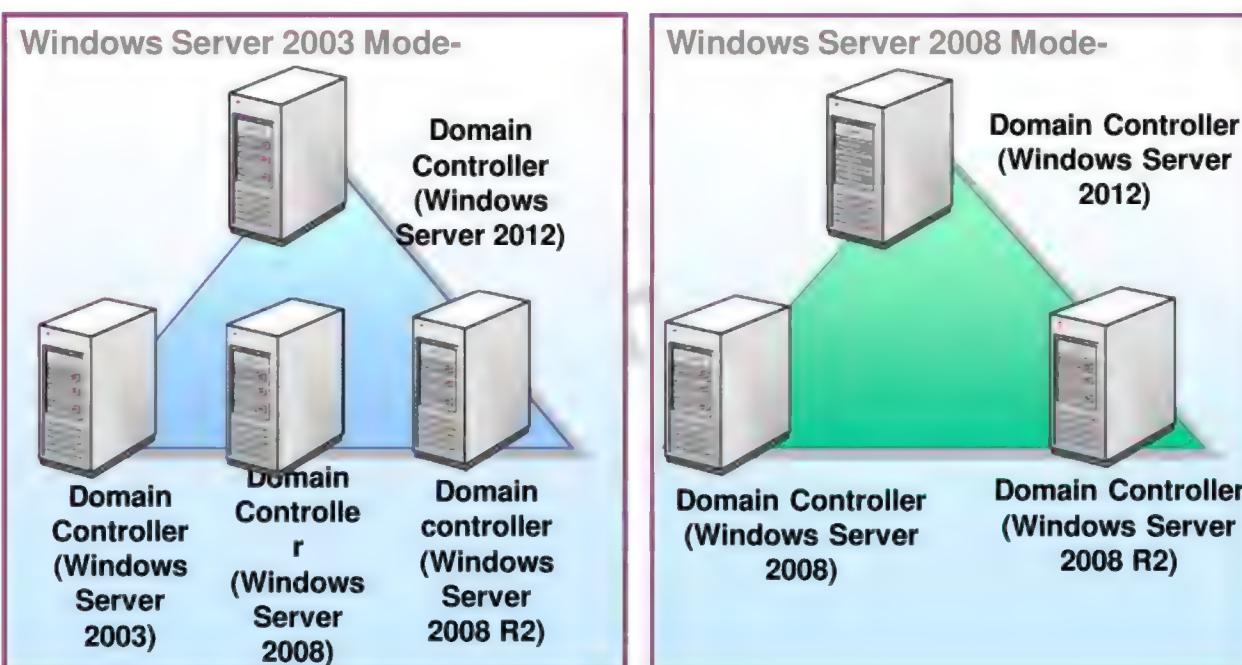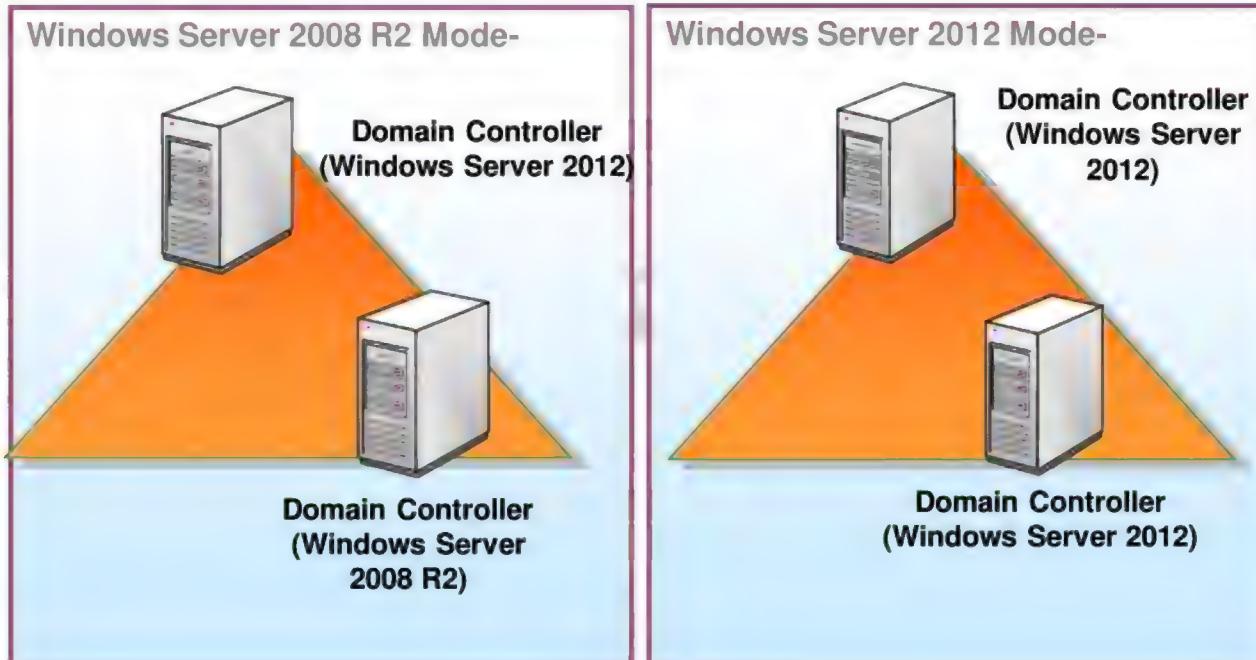
Forest Functional Levels	Supported Domain Functional Levels
Windows Server 2003	Windows Server 2003 Windows Server 2008 Windows Server 2008 R2 Windows Server 2012
Windows Server 2008	Windows Server 2008 Windows Server 2008 R2 Windows Server 2012
Windows Server 2008 R2	Windows Server 2008 R2 Windows Server 2012
Windows Server 2012	Only Windows Server 2012

- Domain functional levels can be raised independently of other Domains

- Raising forest functional level is performed by Enterprise Admin

  - Requires all Domain Functional levels to be at Windows Server 2003 or Windows Server 2008 functional levels

- Active Directory Recycle Bin provides a way to restore deleted objects without AD DS downtime

- Uses Windows PowerShell with Active Directory Module or the Active Directory Administrative Center to restore objects
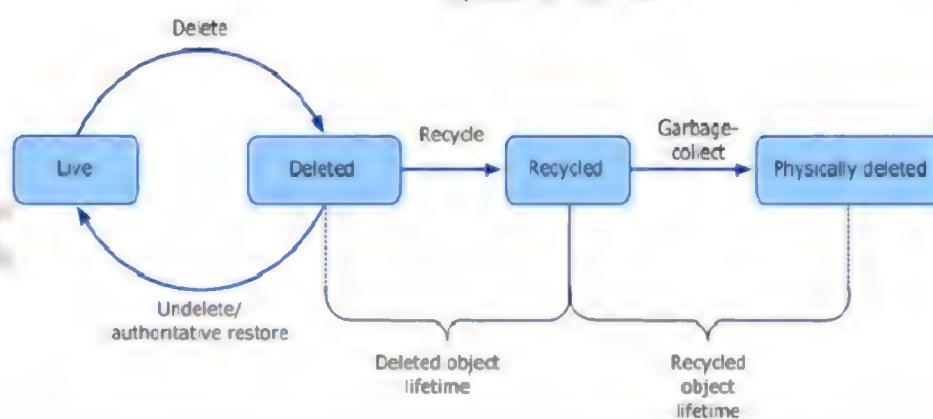
ACTIVE DIRECTORY

Directory Partitions

Forest-wide replication (every dc in forest has a replica)

Schema — Contains definitions and rules for creating and manipulating all objects and attributes

Configuration — Contains information about active directory structure

Domain-wide replication

MS.com — Contains information about all domain-specific objects created in active directory

Configurable replication

Application — Contains application data
Forest dns zones
Domain dns zones

All partitions together comprise the active directory database

76

- **The global catalog contains Complete information of Host Domain & partial information of other domains in a forest.**

- **By searching against the GC, individual domains do not have to be queried in most cases- GC can resolve**

- **Servers that hold a copy of the global catalog are called global catalog servers.**

Physical Structure of Active Directory

- **Physical Structure**
  - **Domain Controllers**
  - **Sites**

- A set of well-connected IP subnets.

- Site can be generally used for locating services (E.g. Logon), replication, group policy application.

- Sites are connected with site links.

- A site can span multiple domains.

- A domain can span multiple sites.
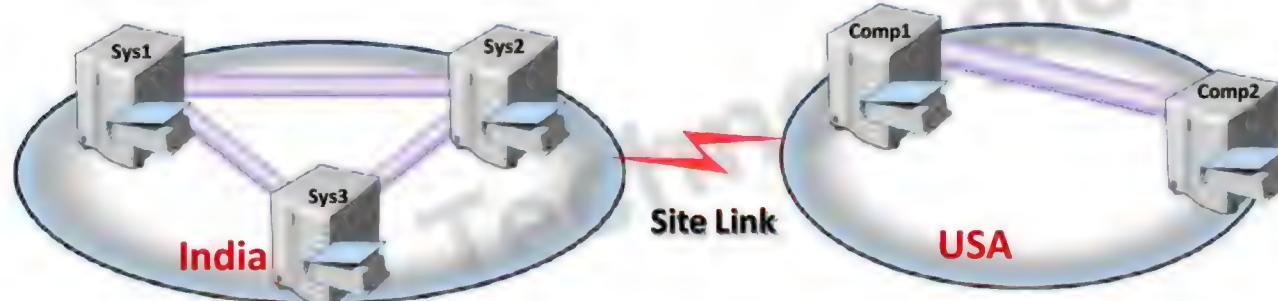
Read-Only Domain Controllers (RODCs)

- RODC addresses some of the problems that are commonly found in branch offices.

- These locations might not have a DC, Or they might have a writable DC but no physical security to that DC, low network bandwidth, or inadequate expertise to support that DC.

Functionality of RODCs

- Read-only AD DS database

- Uni-directional replication

- Credential caching

- Administrator role separation

ZOOM
TECHNOLOGIES

- Except for account passwords, an RODC holds all the Active Directory objects and attributes that a writable domain controller holds.

- However, changes cannot be made to the database that is stored on the RODC. Changes must be made on a writable domain controller and then replicated back to the RODC.

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Uni-directional Replication

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TECHNOLOGIES

- Because no changes are written directly to the RODC, no changes originate at the RODC. Accordingly, writable DCs do not have to pull changes from the RODC. This means that any changes or corruption that a malicious user might make at branch locations cannot replicate from the RODC to the rest of the forest.

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Credential Caching

- By default, an RODC does not store any user credentials.

- You must explicitly allow any credential to be cached on an RODC.

Administrator Role Separation

- You can delegate local administrative permissions for an RODC to any domain user without granting that user any user rights for the domain or other domain controllers.

- In this way, the branch user can be delegated the ability to effectively manage and perform maintenance work on the server, such as upgrading a driver in the branch office RODC only, without compromising the security of the rest of the domain

- If you have a network that is slow, unreliable, or costly, you might find it necessary to add another domain controller at a remote location or branch office.

- IFM process must take place over a potentially unreliable WAN connection. As an alternative, and to significantly reduce the amount of traffic copied over the WAN link

- Most of the copying is then done locally (perhaps from a USB drive), and the WAN link is used only for security traffic and to ensure that the new domain controller receives any changes that are made after you create the IFM backup
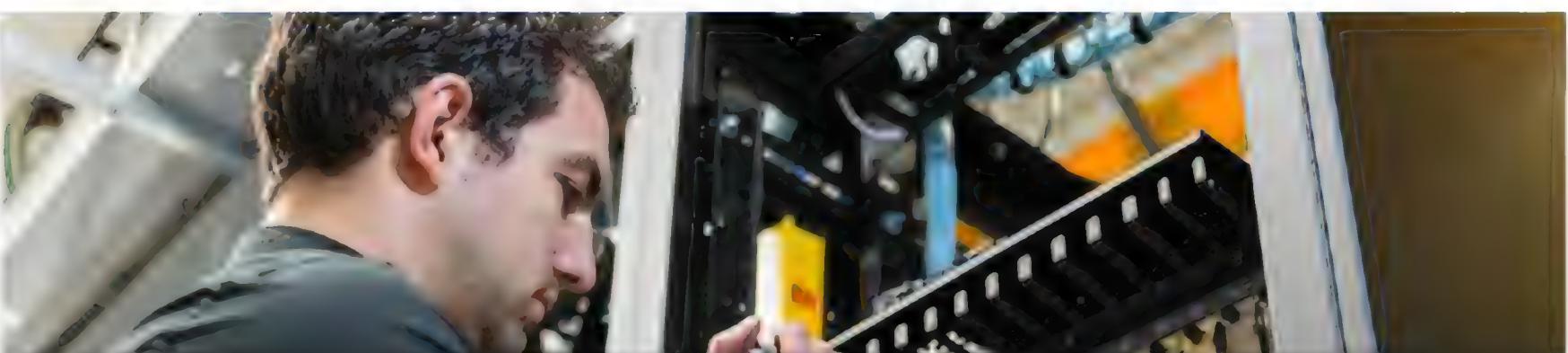
DYNAMIC HOST CONFIGURATION PROTOCOL

IP addresses can be

- **Static IP address**
  - Addresses that are manually assigned and do not change over time
- **Dynamic IP address**
  - Addresses that are automatically assigned for a specific period of time and might change

- It gives IP Addresses automatically to the clients who is requesting for an IP Address

- Centralized IP Address management

- DHCP prevents IP address conflicts and helps conserve the use of client IP Address on the network

- DHCP reduces the complexity and amount of administrative work by assigning TCP/IP configuration automatically to the Clients.

AUTHORIZATION

- In Domain model the DHCP server should be authorized to assign the IP Addresses to clients.

- It is a security precaution that ensures that only authorized DHCP servers can run in the network. To avoid computers running illegal DHCP servers in the network.

SCOPE

- A scope is a range of IP addresses that are available to be leased to clients.

DHCP Lease Generation Process

1	DHCP client broadcasts a DHCPDISCOVER packet
2	DHCP servers broadcast a DHCPOFFER packet
3	DHCP client broadcasts a DHCPREQUEST packet
4	DHCP Server1 broadcasts a DHCPACK packet

DHCP Server2

DHCP Server1

DHCP Client

50% of lease duration has expired

1 DHCP client sends a DHCPREQUEST packet

2 DHCP Server1 sends a DHCPACK packet

What is DHCP Reservation?
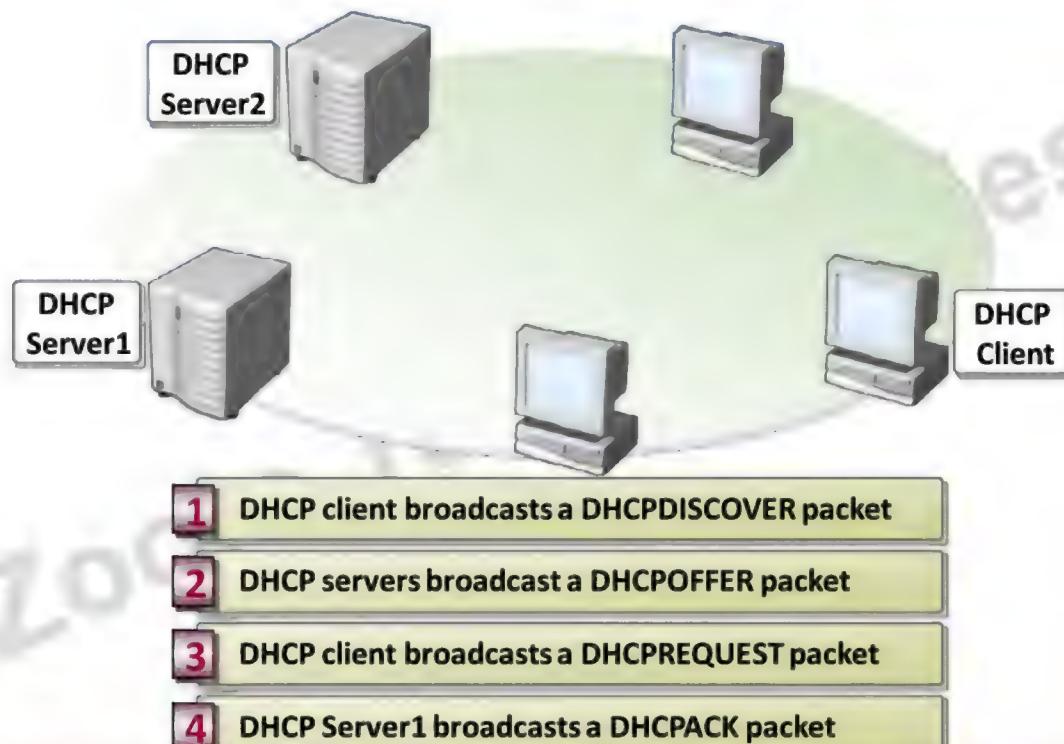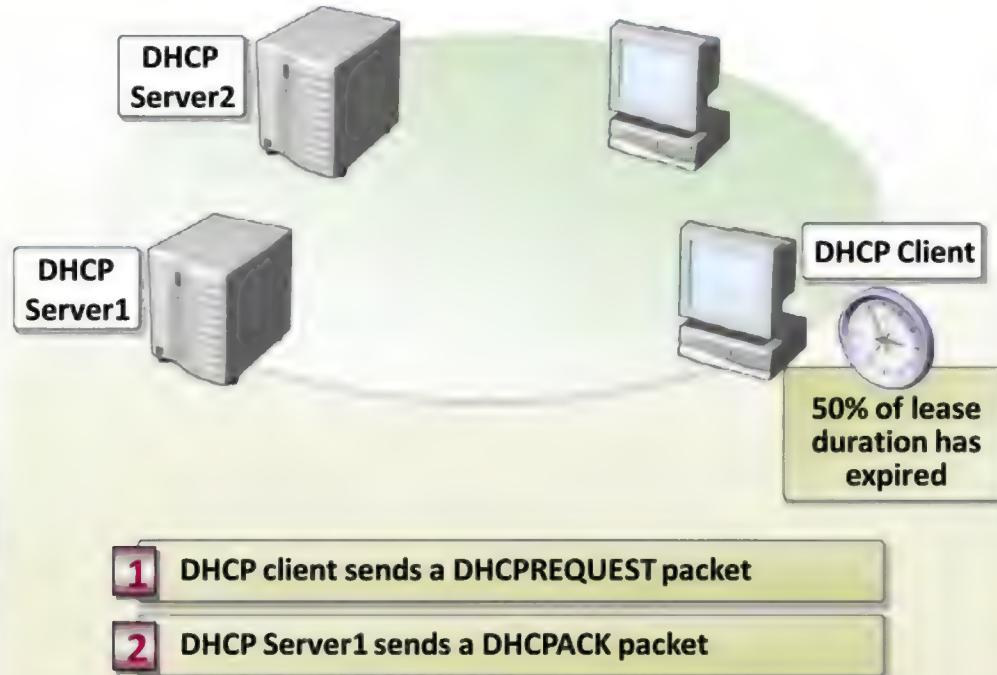
- A reservation is a specific IP address, within a scope, that is permanently reserved to a specific DHCP client

Workstation 1 **File Server**

10.0.0.0 N/W

DHCP Server

Workstation 2

10.0.0.1: Leased to Workstation 1
10.0.0.2: Leased to Workstation 2
10.0.0.3: Reserved for File Server
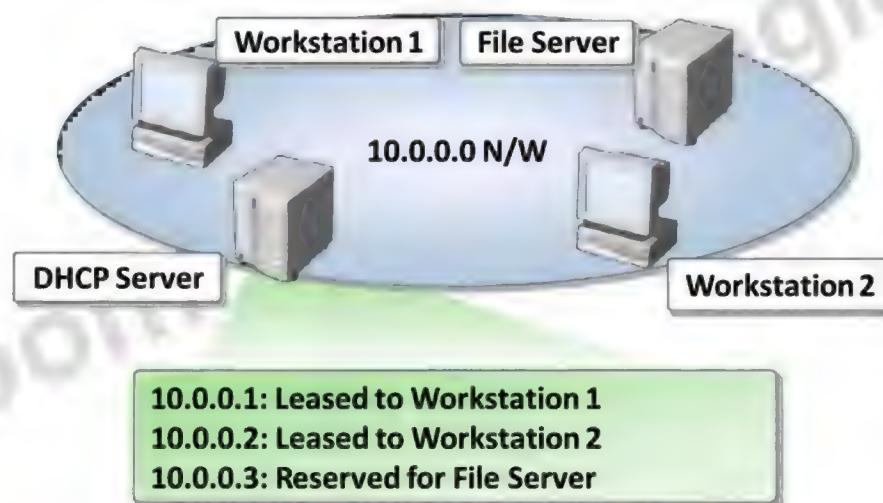
- DHCP Scope options are other server addresses given to clients along with IP Configuration.
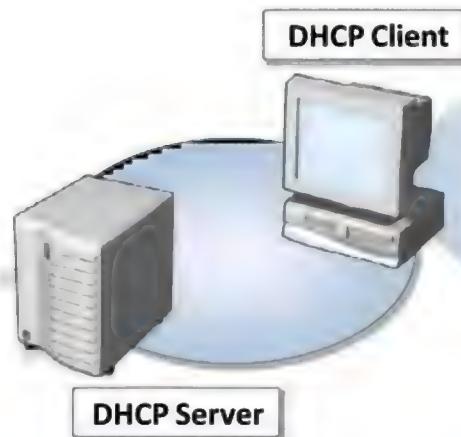
DHCP Client

DHCP Client IP Configuration Data

- Client's IP address
- Client's subnet mask
- DHCP Scope options

DHCP Server

- DHCP failover is a new feature available in Windows Server® 2012 ensuring continuous availability of DHCP service to clients.

- With DHCP failover, two DHCP servers share DHCP scope and lease information, enabling one server to provide DHCP leases to DHCP clients if the other server is unavailable

- Hot stand-by mode: This mode provides redundancy for DHCP services.

- Load balance mode: This mode allocates DHCP client leases across two servers.

DOMAIN NAMING SYSTEM

What is DNS

- **Domain Name Service/Domain Name System**

- **Provides resolution of names to IP addresses and resolution of IP addresses to names**

- **Defines a hierarchical namespace where each level of the namespace is separated by a "."**
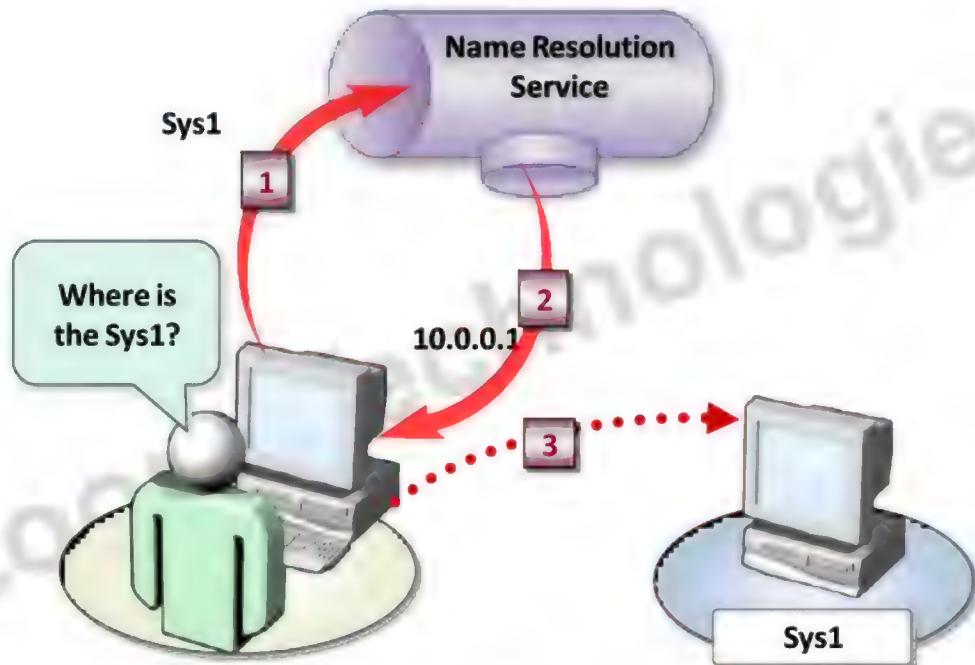
DNS

- **Computer running DNS service can be:**

  - **Microsoft® Windows® Server 2012**

  - **Microsoft® Windows® Server 2008**

  - **Microsoft® Windows® Server 2003**

  - **Microsoft® Windows® 2000 Server**

  - **Microsoft® Windows® NT 4**

  - **UNIX**

  - **Linux**

  - **NetWare Etc.**
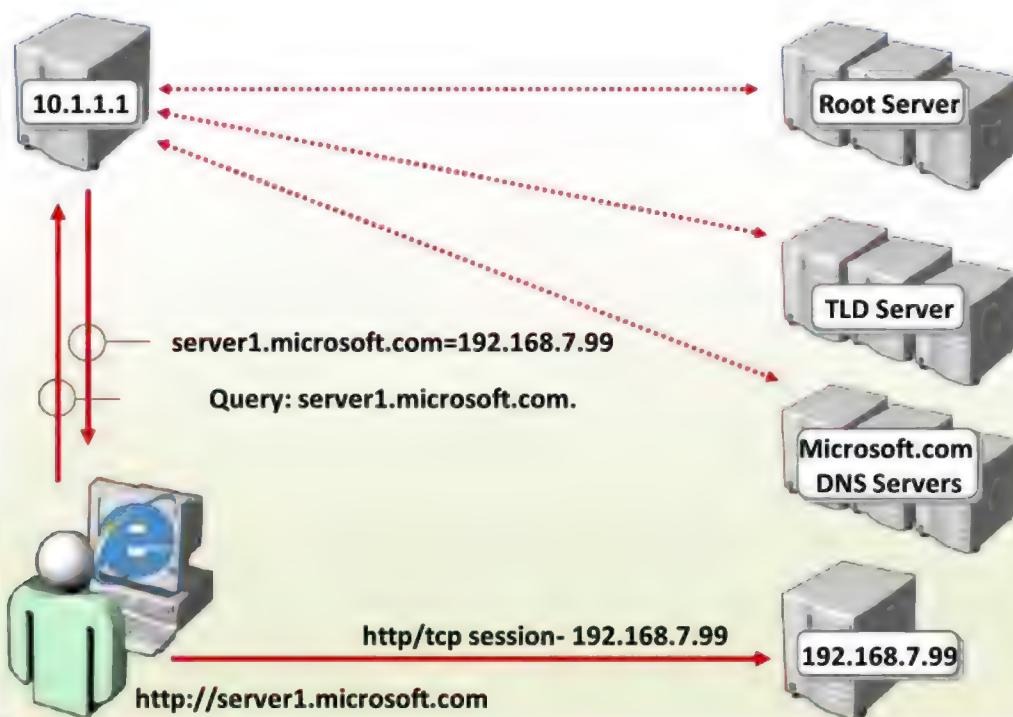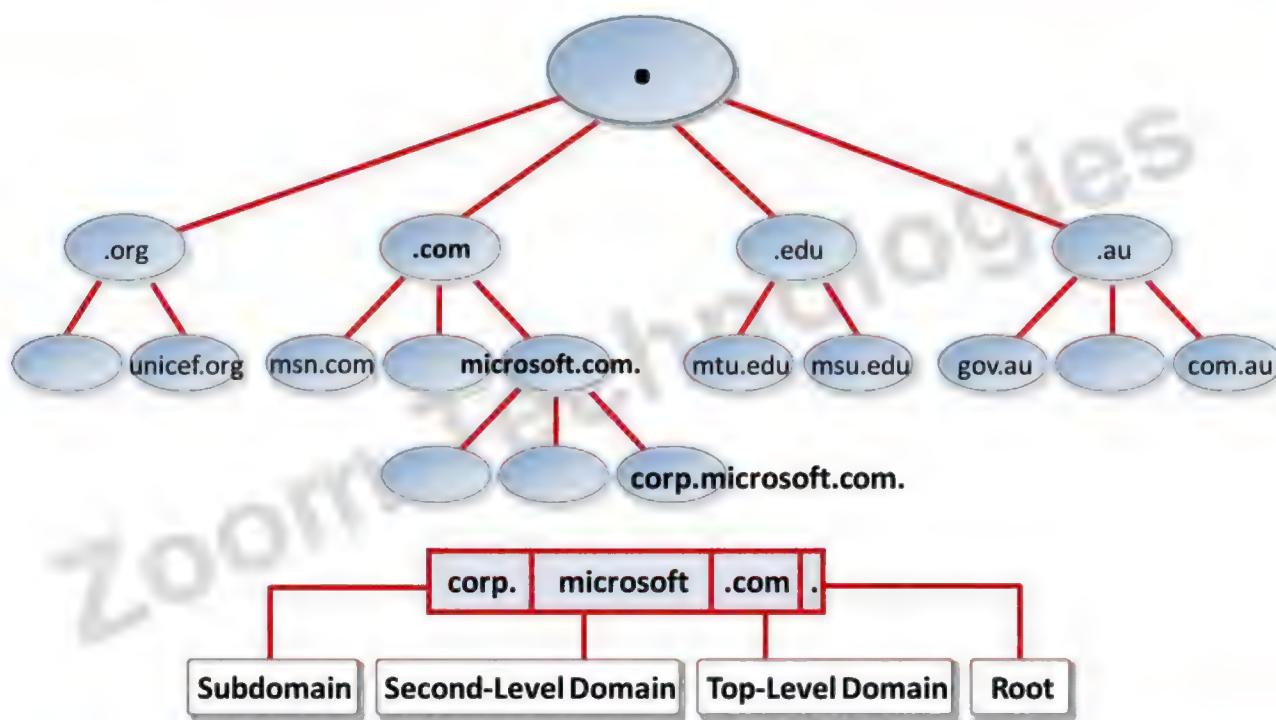
- **An authoritative DNS server will either:**

  – **Return the requested IP address**

  – **Return an authoritative "No"**

- **An Non-authoritative DNS server will either:**

  – **Check its cache**

  – **Use forwarders**

  – **Use root hints**

Fully Qualified Domain Name (FQDN)

- **Identifies a host's name within the DNS namespace hierarchy**

- **Host name + DNS domain name = FQDN**

- **Example:**

  – **Host name: Sys1 & Domain name: MS.com**

  – **Then FQDN = Sys1.MS.com**

- **Forward Lookup**

  – **Requests Name-to-IP Address resolution**

IP address for sys1.MS.com?

IP address = 192.168.1.50

DNS Server
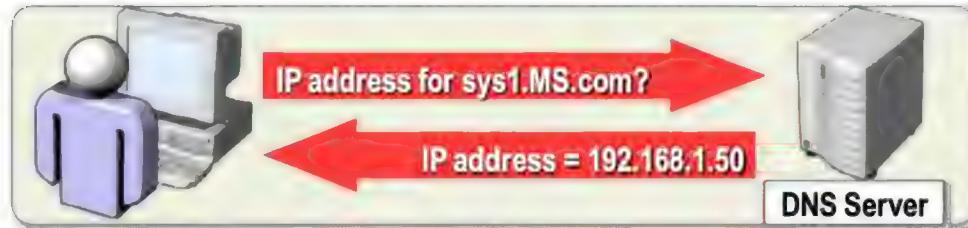
- **Reverse Lookup**

  Requests IP Address to Name resolution

Name for 192.168.1.50?

Name = sys1.MS.com

DNS Server
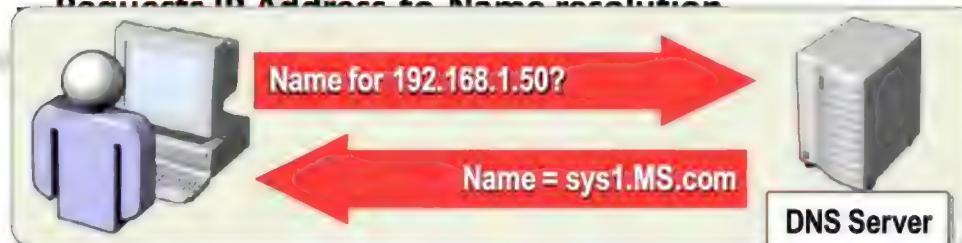
Zone is a storage database which contains all zone Records

- **Forward Lookup Zone**

  – **Used for Resolving Host Names to IP-Address**

  – **It maintains Host to IP Address Mapping Information**

- **Reverse Lookup Zone**

  – **Used for Resolving IP-Address to Host Names**

  – **It maintains IP Address to Host Mapping Information**

- **SOA Record**

  - The first record in any zone file

- **N S Record**

  - Identifies the DNS server for each zone

- **Host Record**

  - Resolves a host name to an IP address

- **Alias Record**

  - Resolves an alias name to a host name

- **Pointer Record**

  - Resolves an IP address to a host name

- **MX Record**

  - Used by the mail server

- **SRV Records (Service Records)**

  - Resolves names of servers providing services

- **Standard Primary**

  - It is the Master Copy of all Zone Information. It is Read/Write copy

- **Standard Secondary**

  - It is Backup to Primary zone. It is Read Only

- **Stub Zone**

  - It contains only NS ,SOA & possibly Glue (A) Records which are used to locate name servers

- **Active Directory Integrated**

  - It stores the information of Zone in ACTIVE DIRECTORY DATABASE

- SRV records allow DNS clients to locate TCP/IP-based Services.

- SRV records are used when:

  - A domain controller needs to replicate

  - A client searches Active Directory

  - A user attempts to change her password

  - An administrator modifies Active Directory

A *forwarder* is a DNS server designated to resolve external DNS domain names

Forwarder

Query
Ask .com

Root (.)

Query for www.MS.com

172.16.64.11

Query
Ask MS.com

.com

Query
Authoritative Response

MS.com

Client
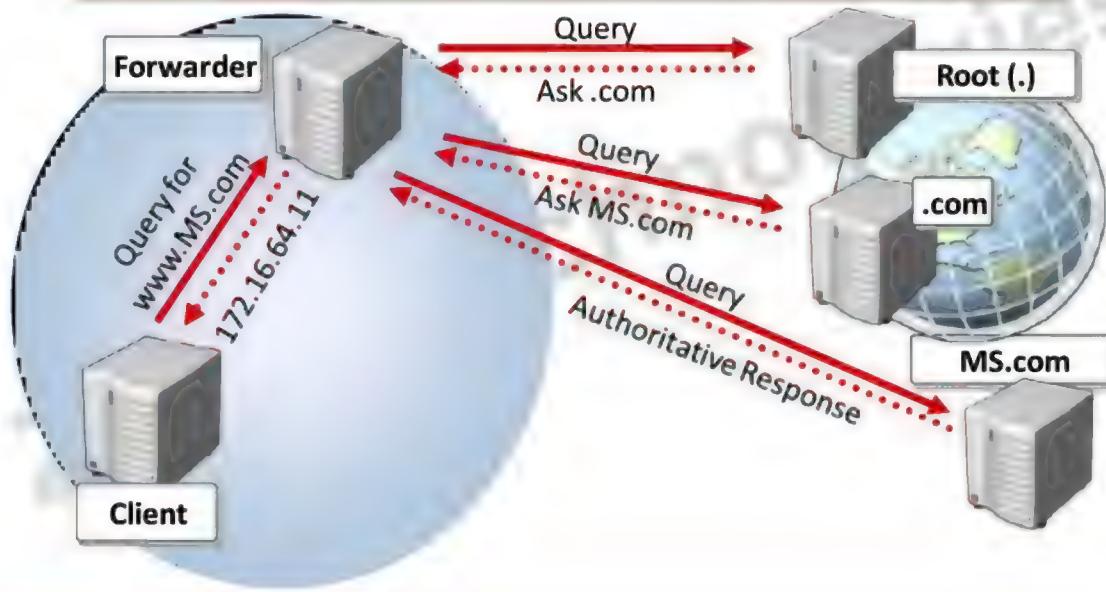
Conditional forwarding forwards requests using a domain name condition
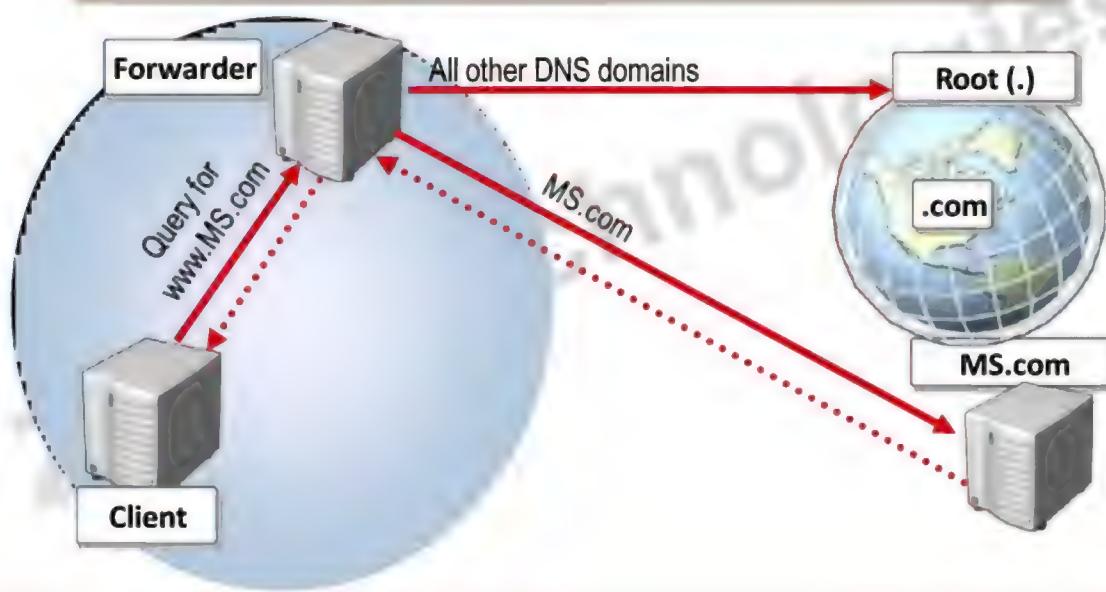
Forwarder

All other DNS domains

Root (.)

Query for www.MS.com

MS.com

.com

MS.com

Client

DNS server cache		
Host name	IP address	TTL
ServerA.MS.com	192.168.8.44	28 seconds

DNS Server

ServerA is at
192.168.8.44

Client1

Client2

ServerA is at
192.168.8.44
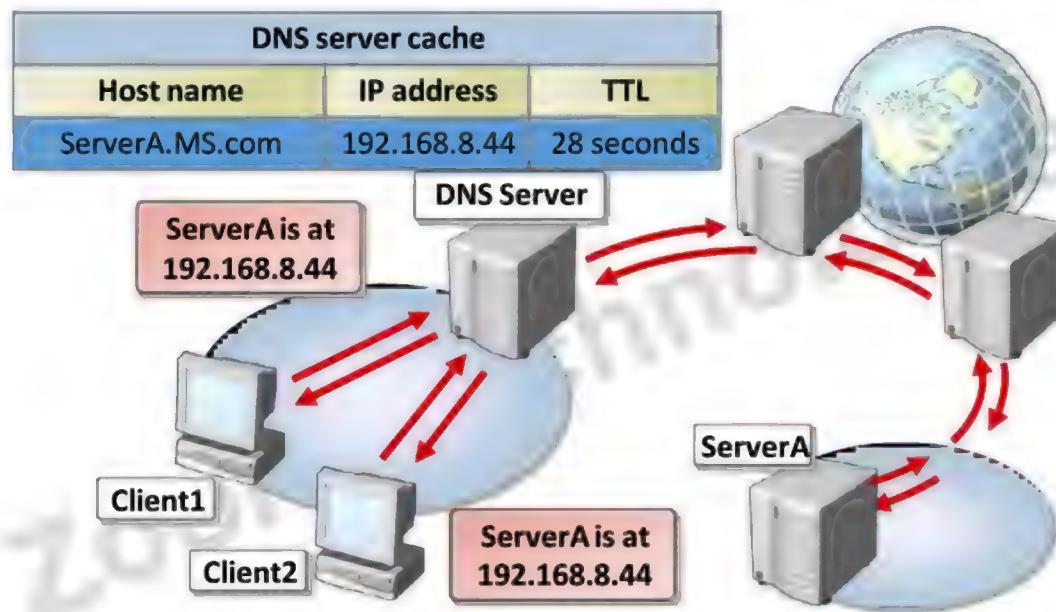
ServerA

INTERNET INFORMATION SERVICES

Internet Information Services (IIS)

- IIS is a service which is used to host the information over internet.

- It provides integrated, reliable, scalable and manageable Web server capabilities over an intranet / internet.

Versions of IIS

- IIS 2.0 in Windows NT 4.0 Operating System

- IIS 5.0 in Windows 2000 Operating System

- IIS 6.0 in Windows 2003 Operating System

- IIS 7.0 in Windows 2008 Operating System

- IIS 8.0 in Windows 2012 Operating System

- **Supports IPv6**

- **Backup & Restoration of website configuration is automatic.**

- **Isolation of Users**

- **Support for Application Developers & Programmers**

IIS 7.0 Services

ZOOM
TECHNOLOGIES

- **World Wide Web (WWW) publishing service (HTTP)**

- **File Transfer Protocol (FTP) service**

World Wide Web (WWW) publishing service (HTTP)

- Http service is used to publish data to World Wide Web quickly & easily.

- This protocol is easily configurable and it supports security and encryption to protect sensitive data.

- Default Port No is 80

Internet Web Server

ZOOM TECHNOLOGIES

Web Server

Http://www.MS.com

Corporate Office Network

Client
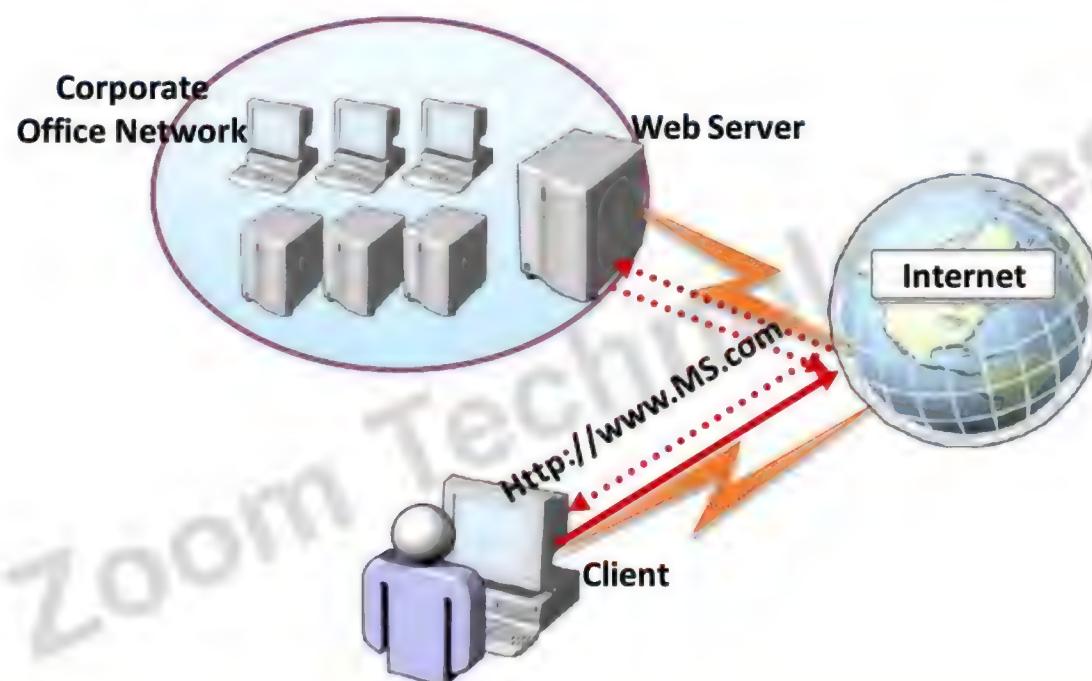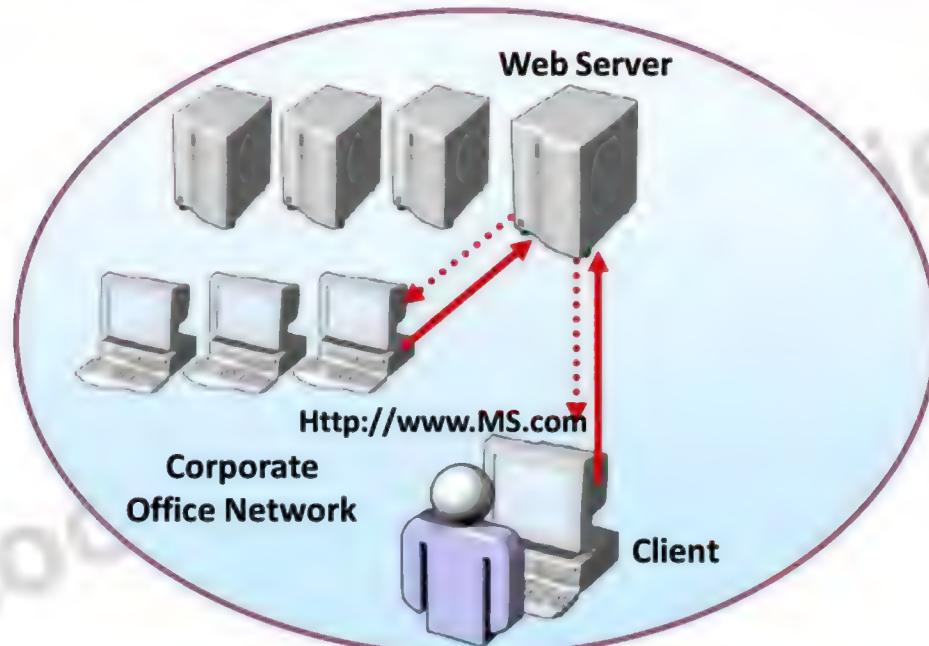
Requirements to Host WEB SERVER   **ZOOM** TECHNOLOGIES

- **Static IP Address (Public IP if published over Internet)**

- **Domain name (Registered Domain name if Published over Internet)**

- **Name Resolution Service like DNS**

- **Home Directory**

  - **Required for each Web site**

  - **Central location of published pages**

- **Virtual Directories are sub directories of the root of the web site.**

- **By using Virtual directories we can create alias or pointer to a directory somewhere else in the same system or another system on the network.**

File Transfer Protocol (FTP) service

- **It is a protocol used to download and upload the files over the internet.**

- **Default Port No is 21**
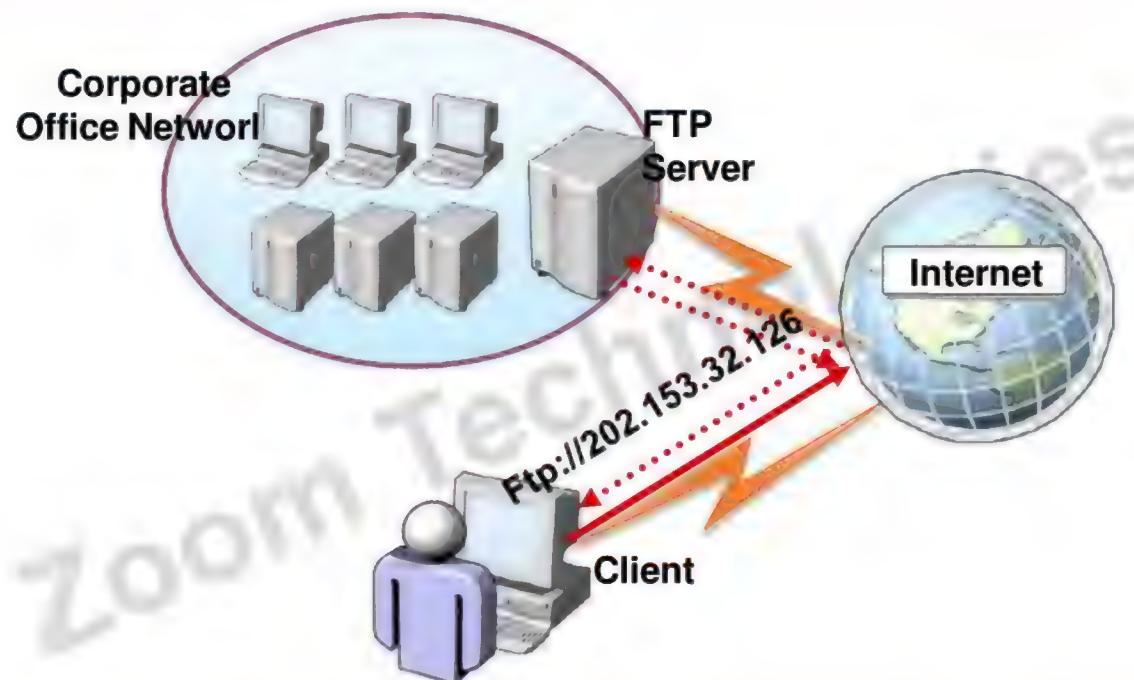
ZOOM TECHNOLOGIES
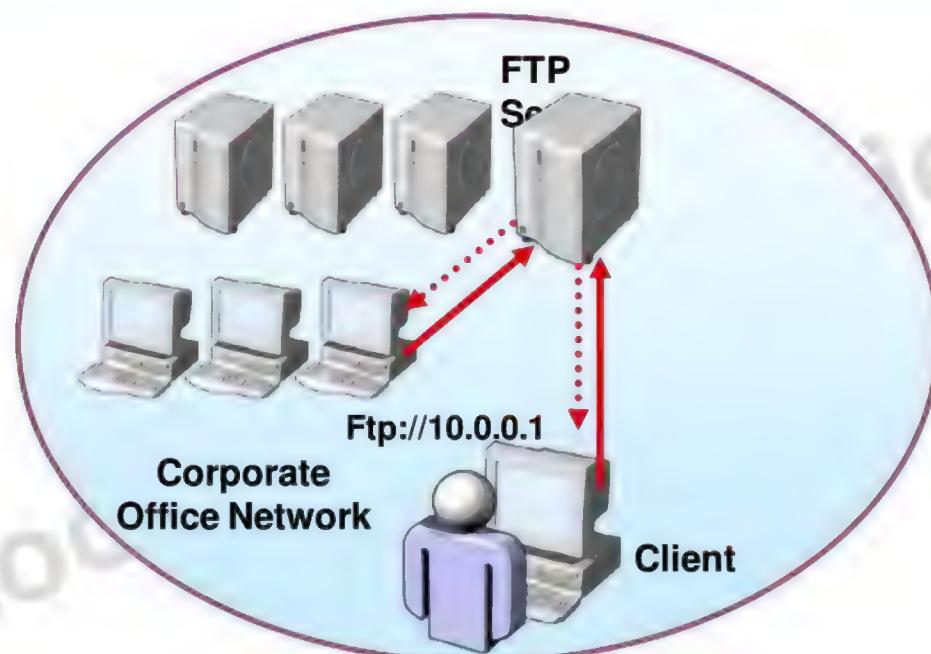
- **Static IP Address (Public IP if published over Internet)**

- **Home Directory**

  - **Required for each FTP site**

  - **Central location of published pages**

WINDOWS DEPLOYMENT SERVICES

ZOOM TECHNOLOGIES
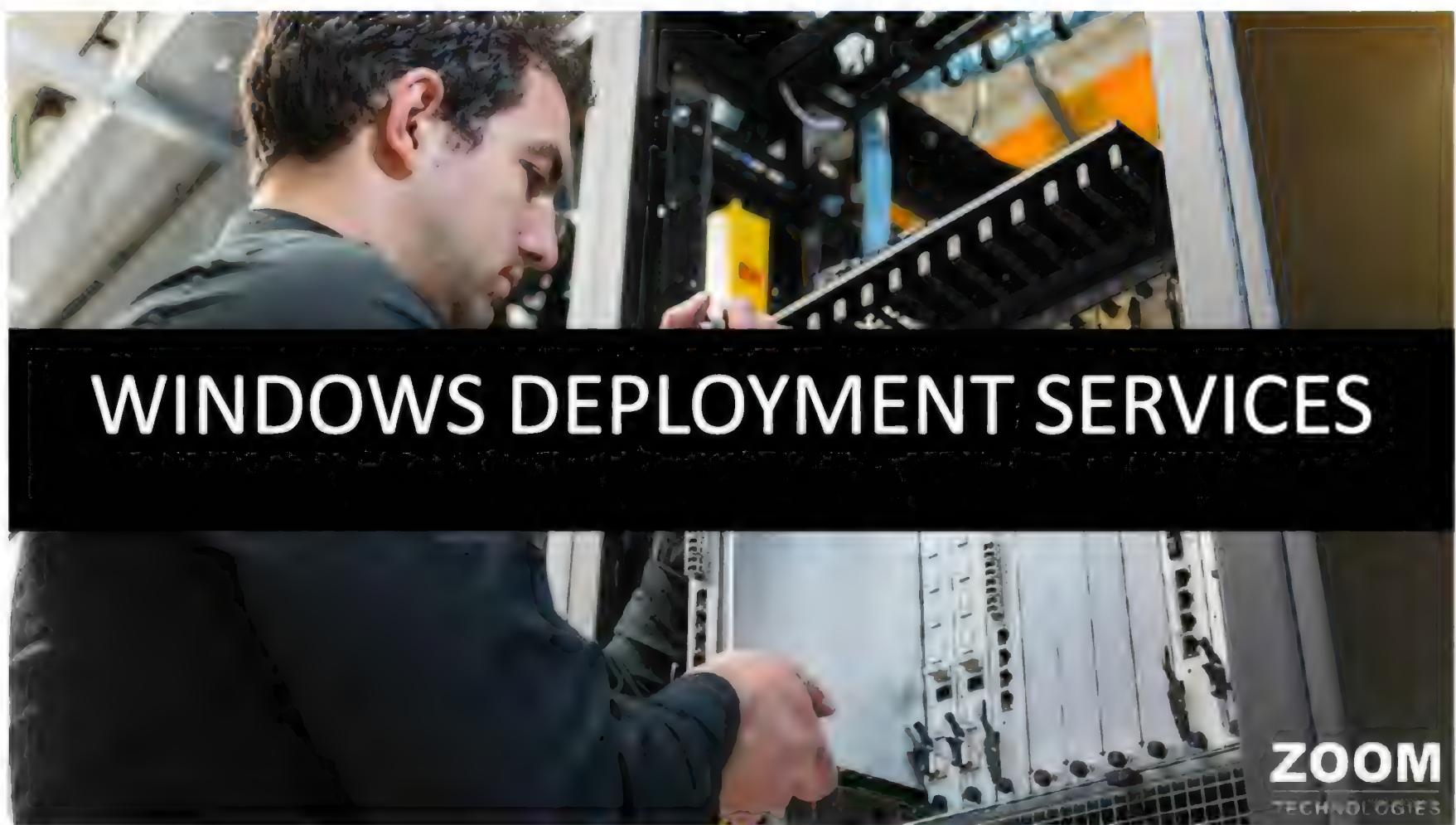
Requirements of WDS- Deployment Server

- DHCP Server

- DNS Server

- Active Directory – Domain Services

- An NTFS Partition to Store Images

How WDS Works?

DHCP Server 10.0.0.1 **DNS Server** 10.0.0.2 **Domain Controller** 10.0.0.3 **WDS Server** 10.0.0.4

Assigns IP Address
Requests IP Address
Searching DC
DC is on 10.0.0.3
Searching WDS
Requests OS
Deploys Image (OS)

WDS Client
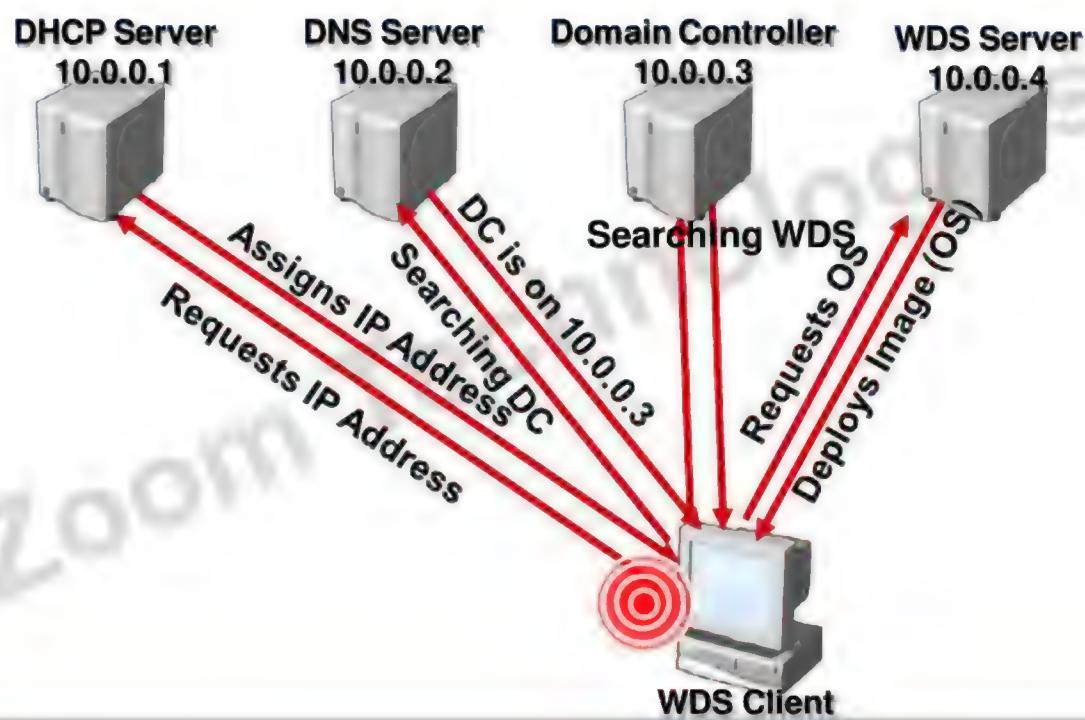
- **Known Clients**

  - **A Known Client Computer is one whose computer account has been pre-created (Pre-Staged) in Active directory.**

- **Un-Known Clients**

  - **An un-known Client Computer is one whose computer account has not been pre-staged in Active directory.**

Types of Images

- **Boot Image**

  - **It is a WIM file you can use to boot a computer to begin the deployment of an O.S to the computer.**

- **Install Image**

  - **It is a image of Windows Vista or Windows server 2008 O.S itself that you want to deploy onto the client computer.**

- **Capture Image**

  - It is a special boot image that you use to boot a master computer and upload an image to a WDS server.

- **Discover Image**

  - It is a boot image that you use to deploy an install image onto a computer that is not PXE enabled.
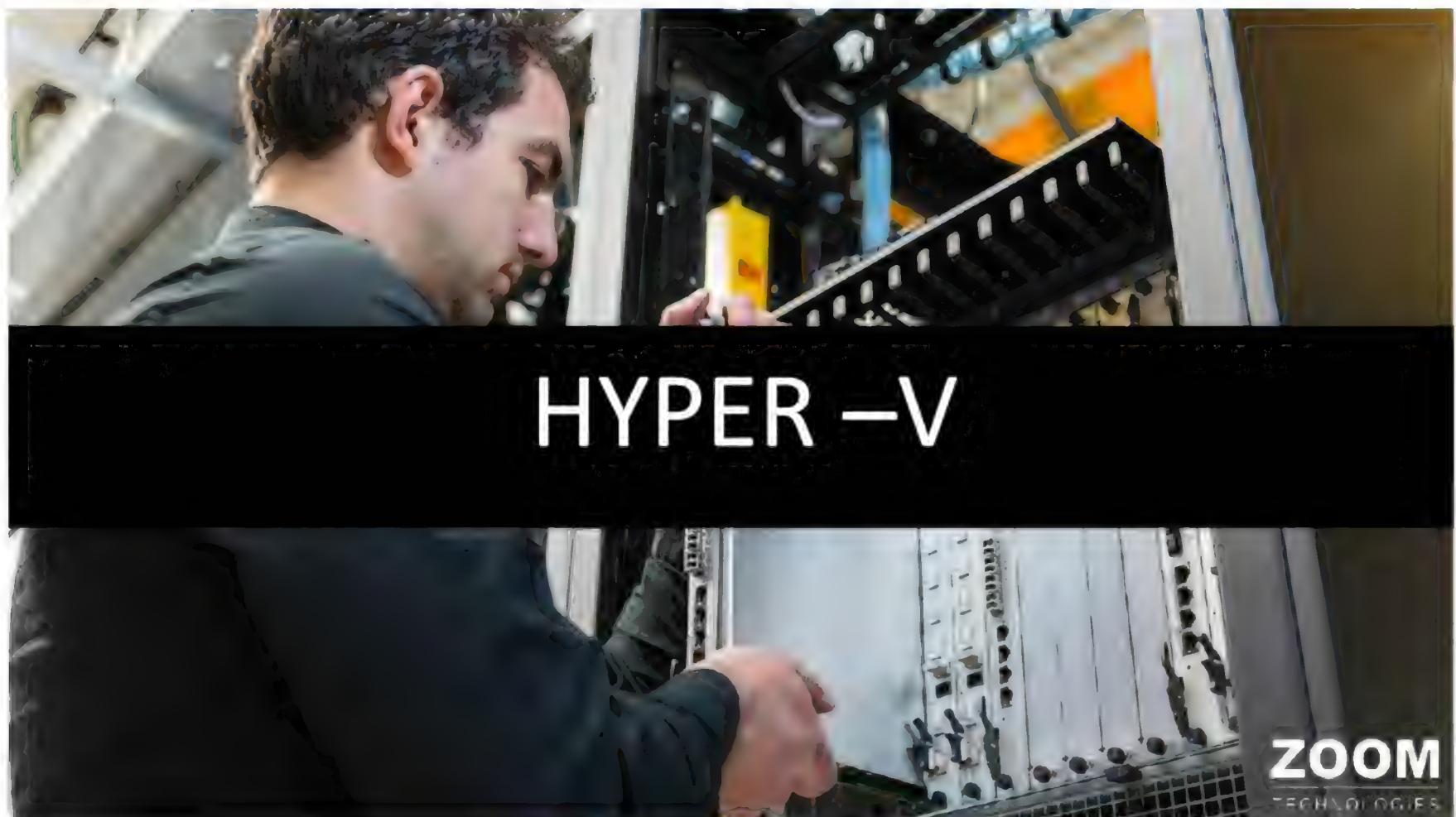
HYPER –V

- Hyper-V is the hardware virtualization role that is available in Windows Server 2012.

- Hardware virtualization provides virtual machines with direct access to the virtualization server's hardware.

- This is in contrast to software virtualization products such as Microsoft Virtual Server 2005 R2, that use the virtualization server's operating system to provide indirect access to the server's hardware.

Type-I Hypervisor

- Also called as bare metal virtualization.
- Hypervisor is directly installed on hardware.
- Robust
- Used in production environment.

Company Name	Hypervisor Name
Microsoft	Hyper-V
Vmware	Esxi
Citrix	Xen Server

- Hosted virtualization.
- Slow
- Testing and lab.

Company Name	Hypervisor Name
Microsoft	Virtual Server
VM Ware	Workstation
Oracle	Oracle Virtual Box

- The server must have an x64 platform that supports hardware assisted virtualization and Data Execution Prevention.

- The server must have enough CPU capacity to meet the requirements of the guest virtual machines.

  - A virtual machine hosted on Hyper-V in Windows Server 2012 can support up to 64 virtual processor

- The server must have enough memory to support all of the virtual machines that must run concurrently, plus enough memory to run the host Windows Server 2012 operating system.

  - The server must have at least 4 GB of RAM.

  - A virtual machine hosted on Hyper-V in Windows Server 2012 can support a maximum of 1 terabytes (TB) of RAM

- The storage subsystem performance must meet the input/output (I/O) needs of the guest virtual machines. Whether deployed locally or on storage area networks (SANs), you may have to place different virtual machines on separate physical disks, or you may have to deploy a high performance redundant array of independent disks (RAID), solid-state drives (SSD), hybrid-SSD, or a combination of all

- **The virtualization server's network adapters must be able to support the network throughput needs of the guest virtual machines. You can improve network performance by installing multiple network adapters and using multiple Network Interface Cards (NICs).**

Virtual Machine Hardware

Virtual machines have the following simulated hardware by default:
- BIOS
- Memory
- Processor
- IDE Controller 0 and 1
- SCSI Controller
- Synthetic Network Adapter
- COM 1 and 2
- Diskette Drive

You can add the following hardware to a virtual machine:
- SCSI Controller (up to 4)
- Network Adapter
- Legacy Network Adapter
- Fibre Channel adapter
- RemoteFX 3D video adapter
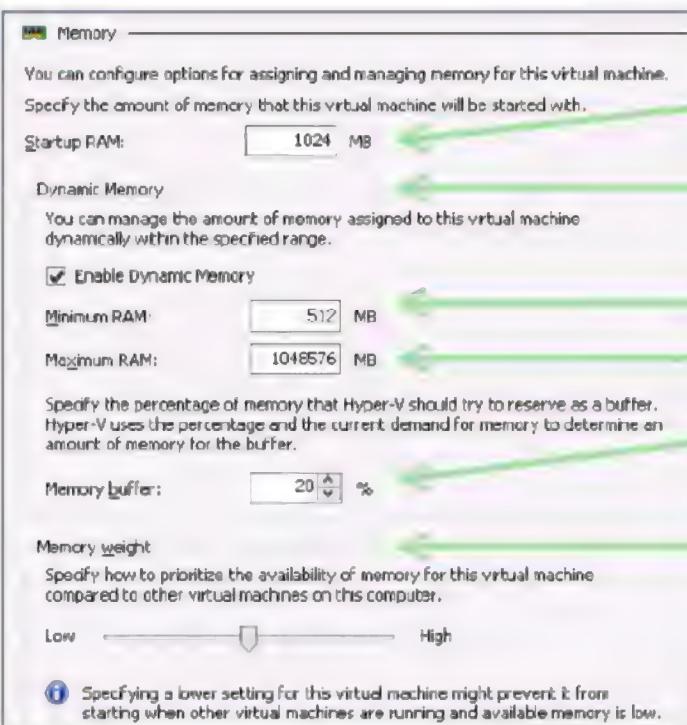
Startup RAM

Dynamic Memory

Minimum RAM
Maximum RAM

Memory buffer

Memory weight

What Is a VHD?

- A virtual hard disk is a file that represents a traditional hard disk drive

- VHDX format has the following benefits over the VHD format:

  - The disks can be larger (64 TB versus 2 TB)

  - The disk is less likely to become corrupted

  - The format supports better alignment when deployed to a large sector disk

  - The format supports larger block size for dynamic and differencing disks

Creating Virtual Disk Types

- **Dynamically expanding VHDs**

- **Fixed-size VHDs**

- **Direct-attached storage**

Pass -through Disk

- **Hyper-V allows virtual machines to access storage mapped directly to the Hyper-V server without requiring the volume be configured.**

- **The storage can either be a physical disk internal to the Hyper-V server or it can be a Storage Area Network (SAN) Logical Unit (LUN) mapped to the Hyper-V server.**

- **To ensure the Guest has exclusive access to the storage, it must be placed in an Offline state from the Hyper-V server perspective.**

Differencing VHDs

- **Differencing disks reduce space used by storage at the cost of performance**

- **You can link multiple differencing disks to a single parent disk**

- **You cannot modify parent disk**

- **You can use Inspect Disk tool to reconnect a differencing disk to a missing parent**

Virtual Switch

- **External**

  Used to map a network to a specific network adapter or network adapter team

- **Internal**

  Used to communicate between the virtual machines on the host and between the virtual machines and the host itself

- **Private**

  Used to communicate between virtual machines, but not between the virtual machines and the host itself
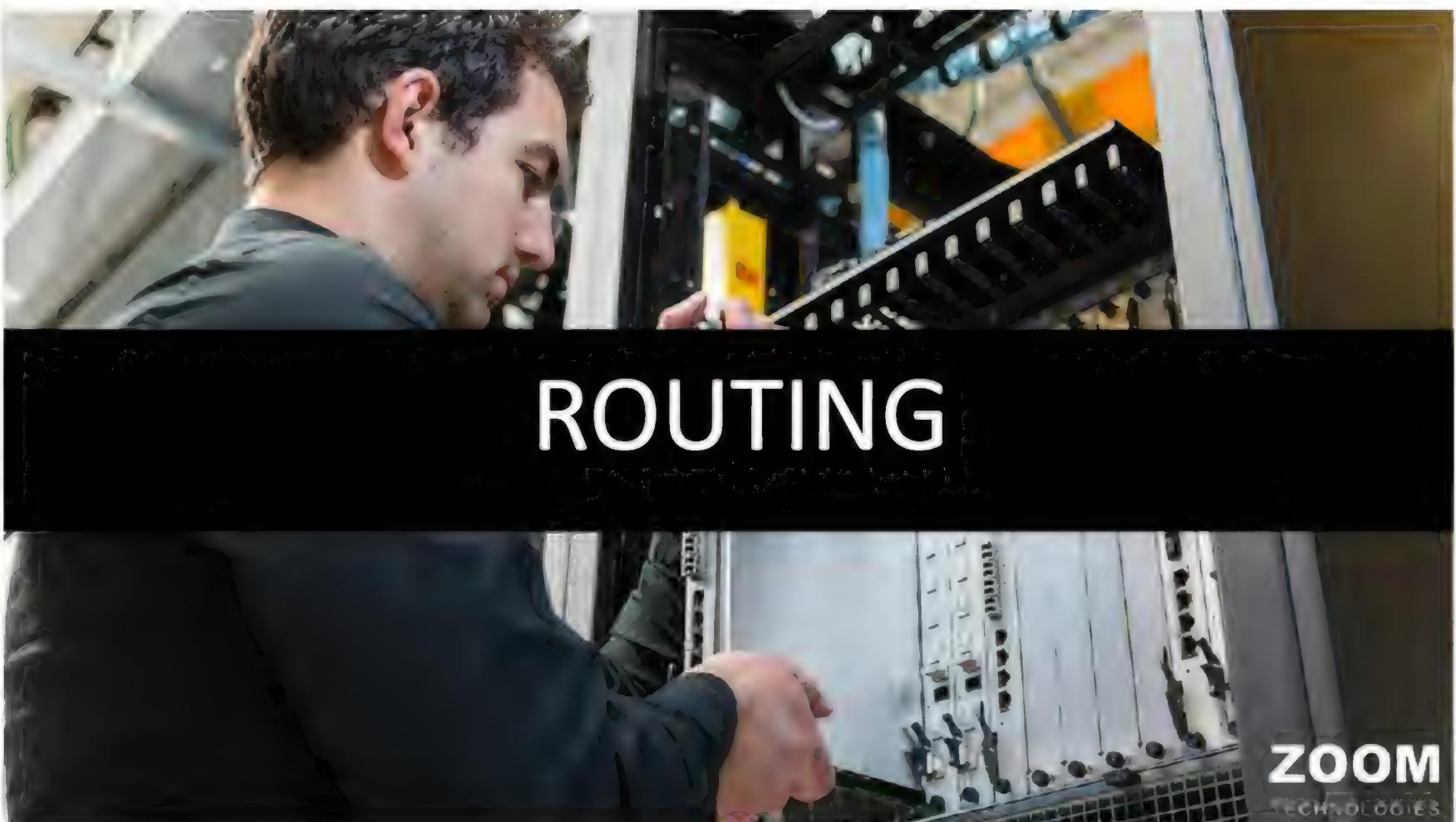
ROUTING

Definition

ROUTER

It is a device used to communicate between two different networks.

ROUTING

It is a process of sending the data packets through the best path to reach the destination.

DEFAULT GATEWAY

It gives the exit point (or) entry point to reach the destination.

Static Routing

Routes should be added manually on the router by the administrator.

Dynamic Routing

Routes will be added automatically by the router with the help of routing protocols

Software Router

It is a computer which performs routing task as one of its multiple tasks.

Hardware Router

It is a Dedicated HARDWARE DEVICE which works only as a router.

- Routing and Remote Access is a service that performs routing as one of its multiple processes.
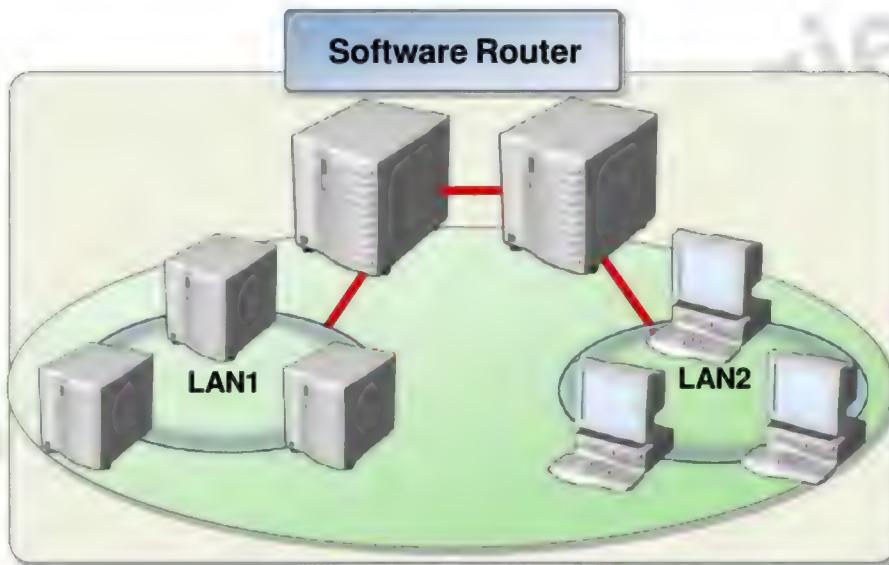
NETWORK ADDRESS TRANSLATION

- Provides access to Internet from a protected private address range

- Translates Private IP's to Public IP's & vice-versa for outgoing and incoming traffic

- Hides private IP address range from the Internet

- Can be used with DHCP or can be configured to assign IP to Client

Client Computers

Interne t

Computer Running NAT
Internal IP = 10.0.0.1
External IP =
202.153.32.1

Web Server
IP =
66.11.10.12

IP = 10.0.0.3

IP = 10.0.0.4

IP = 10.0.0.5

1. The client sends the packet to the computer running NAT

2. The computer running NAT changes the packet header and sends the packet over the Internet to the Web server

3. The Web server sends a reply to the computer running NAT

4. The computer running NAT determines the destination, changes the packet header, and sends the packet to the client
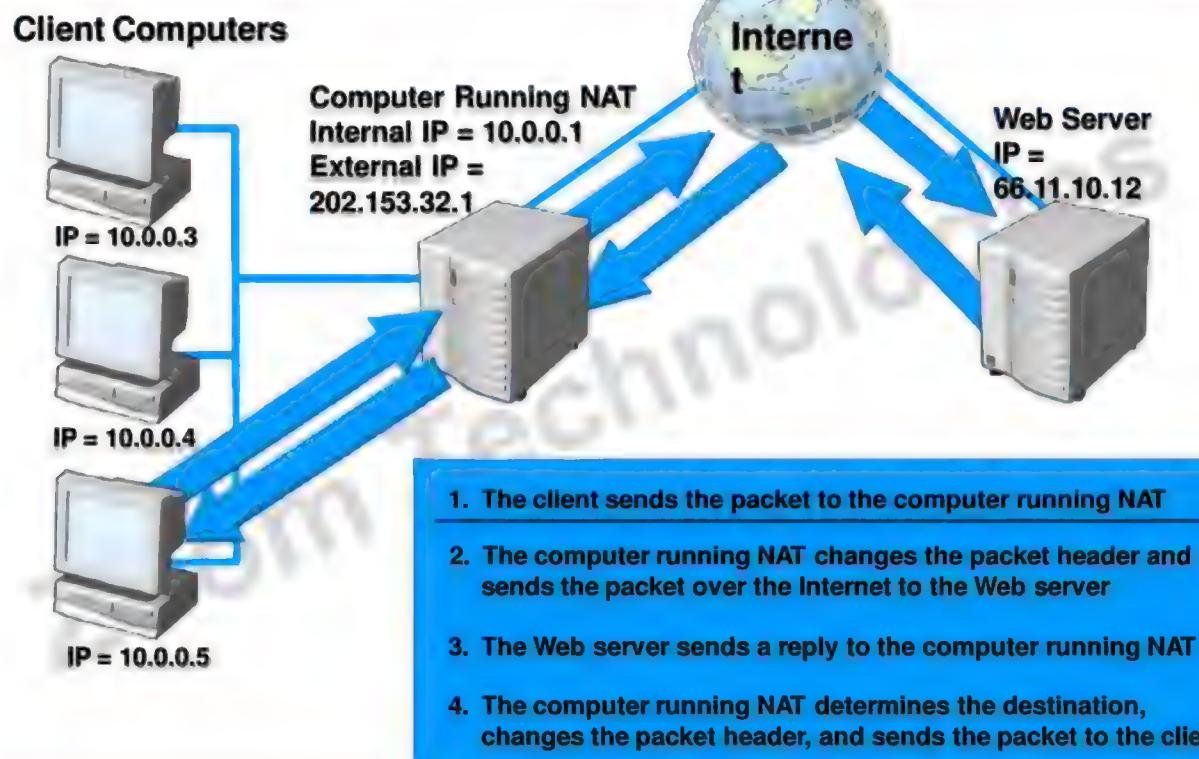
- A DHCP Relay agent is a computer or router that listens for DHCP Broadcasts from DHCP clients and then relays(sends) those messages to DHCP Servers on the another network.

1. Client1 broadcasts a DHCPDISCOVER packet
2. Relay agent forwards the DHCPDISCOVER message to the DHCP server
3. Server sends a DHCPOFFER message to the DHCP relay agent
4. Relay agent broadcasts the DHCPOFFER packet
5. Client1 broadcasts a DHCPREQUEST packet
6. Relay agent forwards the DHCPREQUEST message to the DHCP server
7. Server sends a DHCPACK message to the DHCP relay agent
8. Relay agent broadcasts the DHCPACK packet


REMOTE ACCESS SEVICES

ZOOM
TECHNOLOGIES

- A VPN extends a private network across shared or public networks such as the Internet.

Domain Controller

VPN Server

VPN Client

| 1 | VPN client connects the VPN server | 3 | VPN Server or DHCP server assigns IP to client |
| 2 | VPN server authenticates and authorizes client | 4 | VPN client communicate with Private Network. |
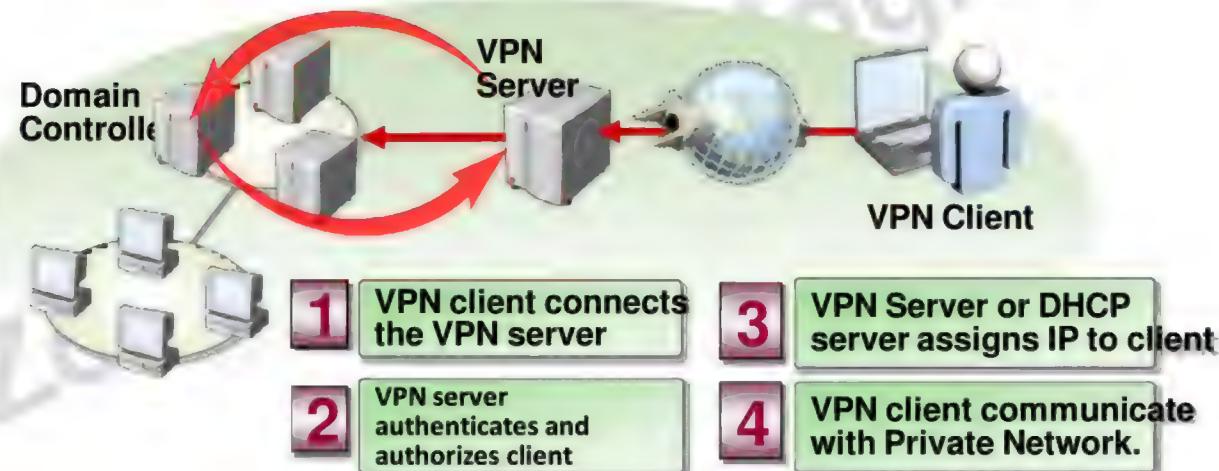
Components of a VPN Connection

VPN Server

**VPN Tunnel
Tunneling Protocols**

VPN Client

Domain Controller

Authentication

DHCP Server

Transit Network

Address and Name Server Allocation

REMOTE DESKTOP SERVICES
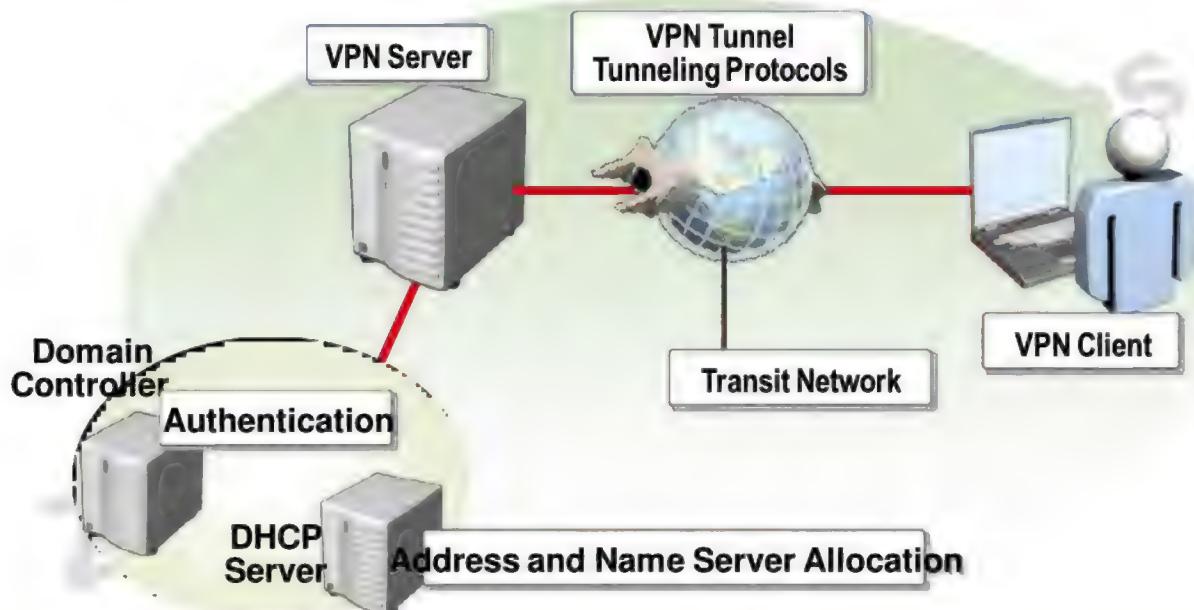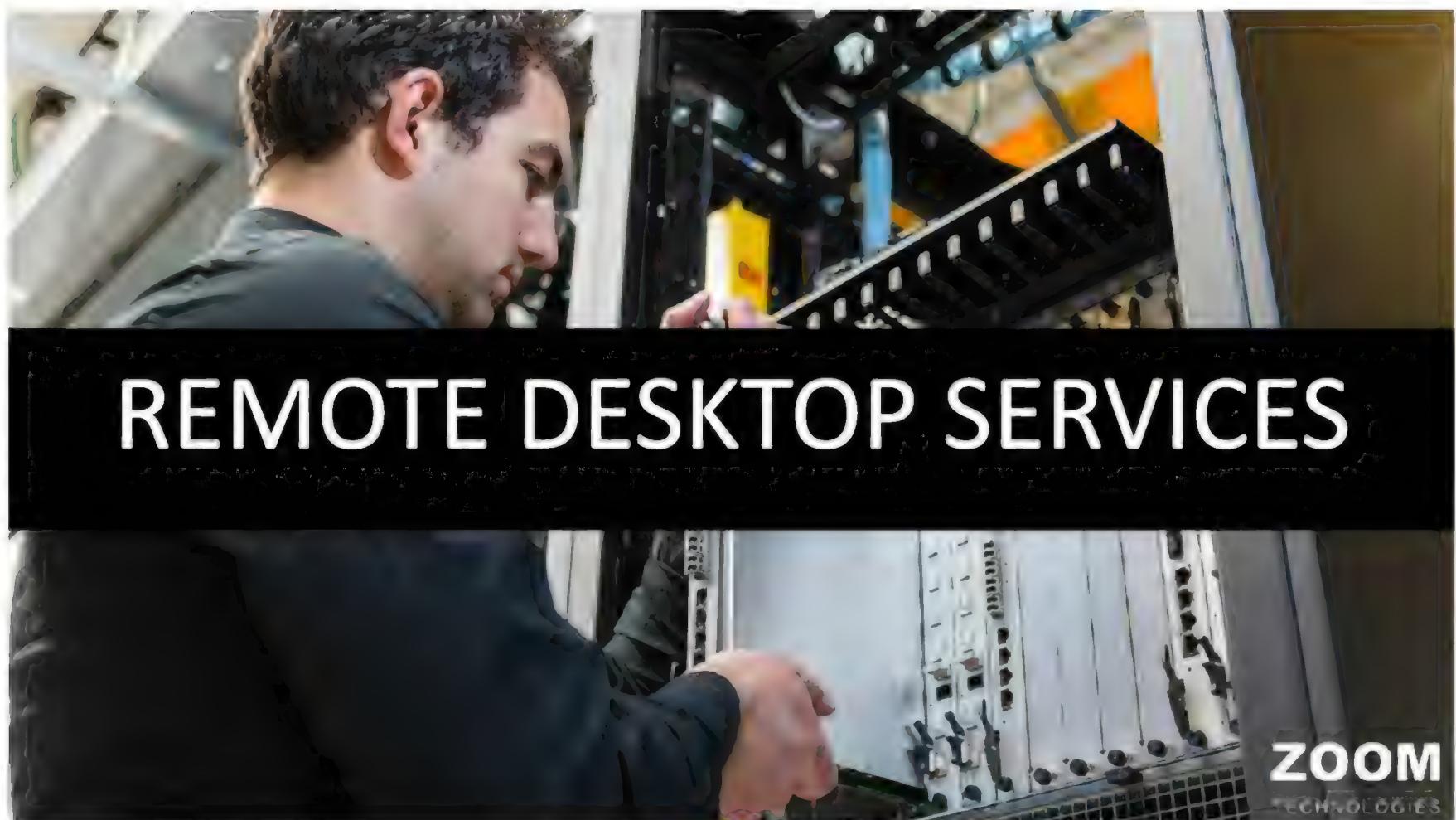
What is Remote Desktop Service?

Terminal Server

User

Remote computer running Remote Desktop Connection
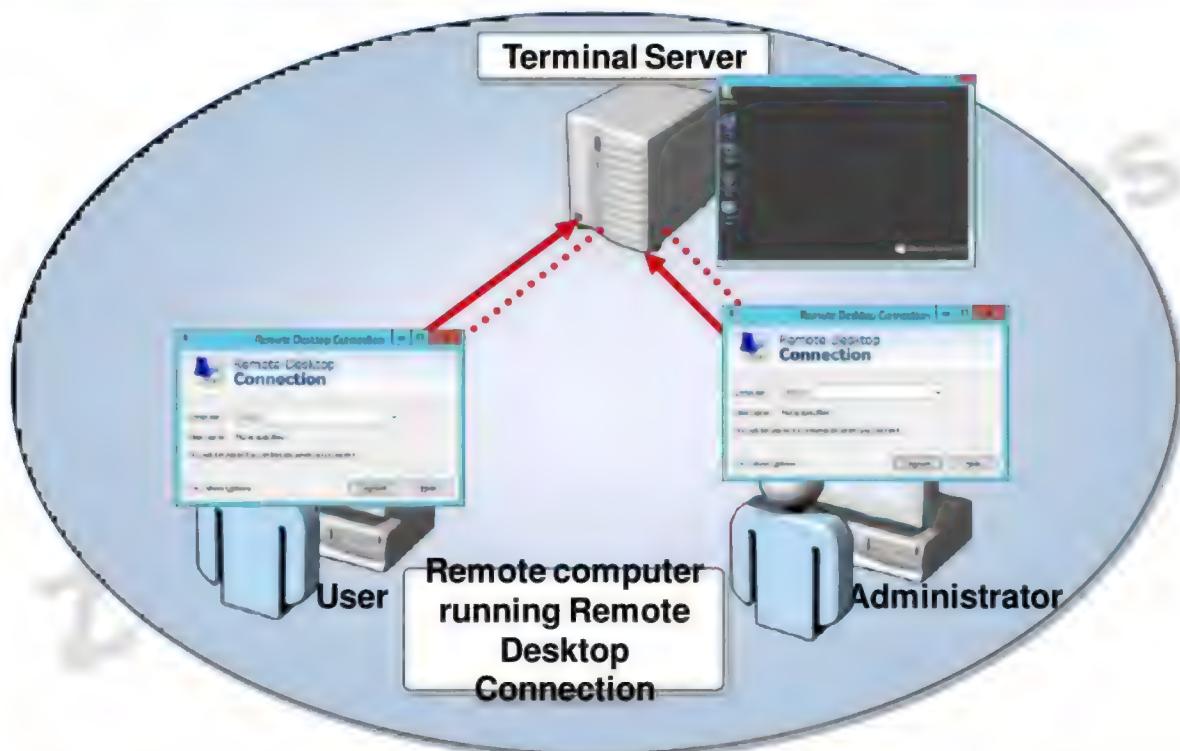
Administrator

- **Remote Administration Mode**

  - **Specially designed for remote management of server.**

  - **Only two connections are Supported.**

  - **License is not required.**

- **Disconnect Session**

  - **If the Session is disconnected all the programs will continue to run in the background & the user can reconnect to same session**

- **Logoff Session**

  - **If the Session is logged off then all programs will be closed and next time new session will be established.**
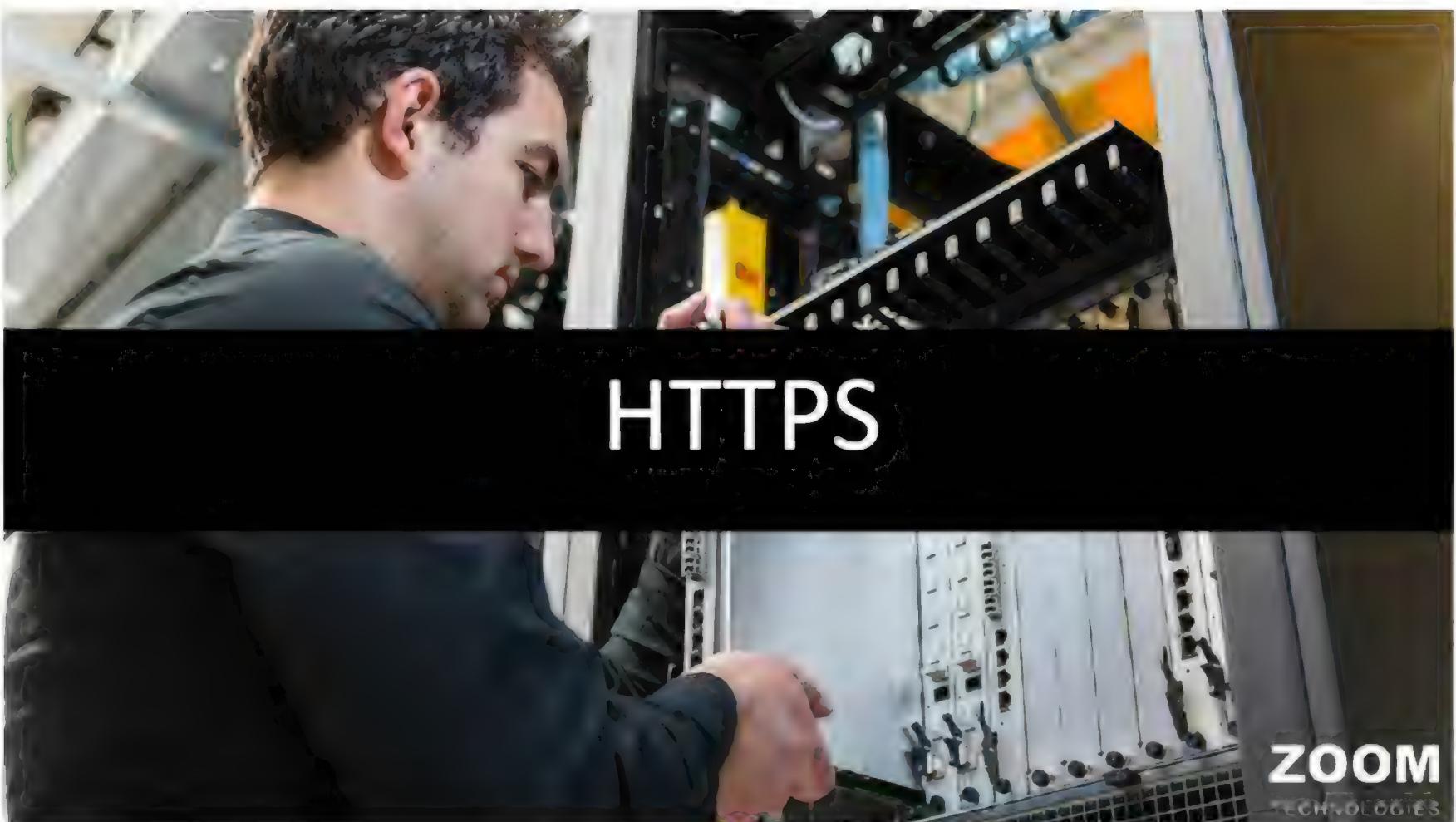
HTTPS

Hypertext Transfer Protocol over Secure Socket Layer (SSL)

- HTTPS encrypts and decrypts the information between the client browser and the web server using a secure Socket Layer (SSL).

- SSL transactions are encrypted between the client and the server, this is usually 40 or 128 bit encryption (the higher the number of bits the more secure the transaction).

- SSL Certificate is issued by a trusted source, known as the Certification Authority (CA).

- CAs verifies the existence of your business, the ownership of your domain name, and your authority to apply for the certificate.

How Secure Sockets Layer Works

- An SSL Certificate enables encryption of sensitive information during online transactions.

- Each SSL Certificate contains unique, authenticated information about the certificate owner.

- A Certification Authority verifies the identity of the Certification owner when it is issued.

- You have an online store or accept online orders and credit cards

- You offer a login or sign-in on your site

- You process sensitive data such as address, date of birth, license etc

- You value privacy and expect others to trust you

CLOUD
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M C S E

STORAGE MANAGEMENT

ZOOM
TECHNOLOGIES

As performance increases, so does cost

SSD

Fast: 1.5mio IPOS

SAS

~210 IOPS

Performance

SCSI

~ 150 IOPS

SATA

Slow

EIDE

Slow

Cost

Built-in Disk Management Tools
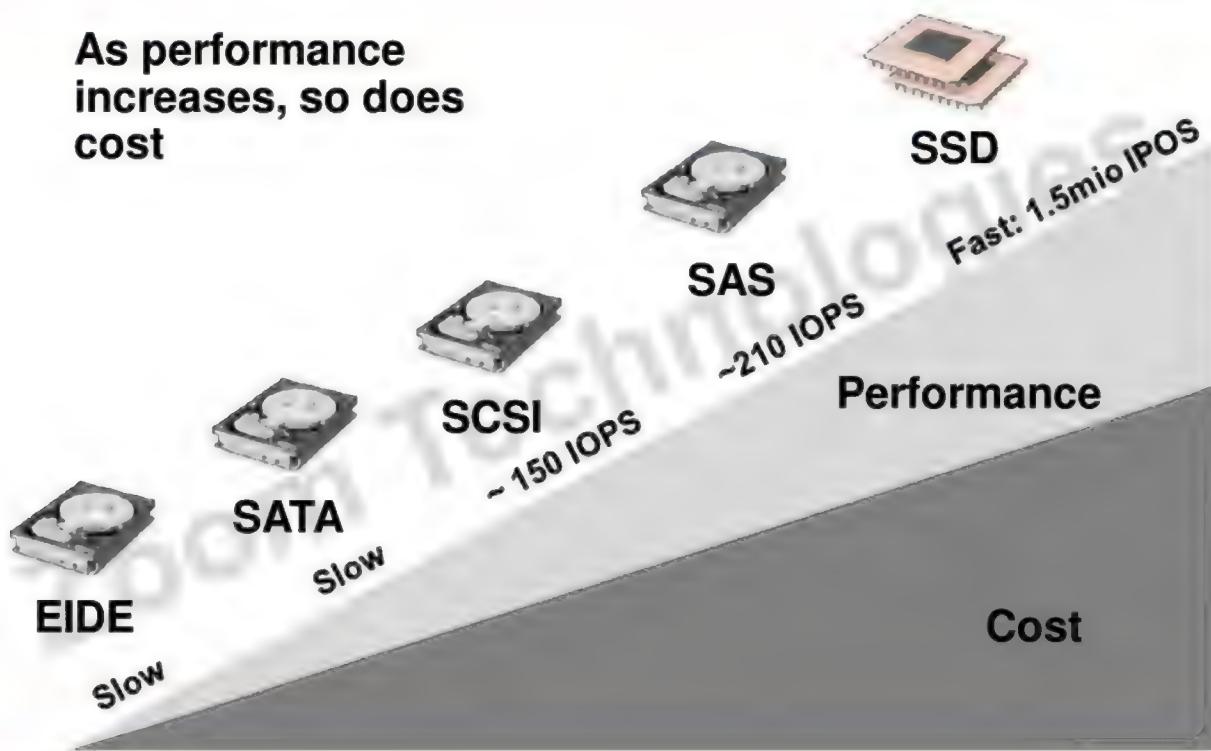
- **Built-in Disk Management Tools in Windows**

  Windows Server 2012

  – **Storage pools.**

  – **Disk Management.**

ZOOM
TECHNOLOGIES

MBR

- **Standard Partition table format since early 1980s**
- **Supports a maximum of 4 primary partitions per drive**
- **Can partition a disk up to 2 TB**

GPT

- **GPT is the successor of MBR partition table format**
- **Supports a maximum of 128 partitions per drive**
- **Can partition a disk up to 18 EB**

✓ **Use MBR for disks smaller than 2 TB**

✓ **Use GPT for disks larger than 2 TB**

ZOOM
TECHNOLOGIES

- A physical disk is sectioned into separate partitions

- A physical disk can have up to three primary partitions and one extended partition

- Extended partitions are subdivided into logical drives

Primary

C:
D:
E:
F:
G:
H:

Extended with logical drives
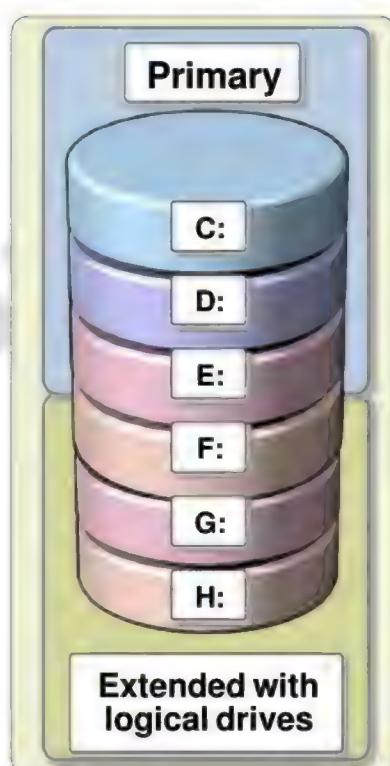
When selecting a file system, consider the differences between FAT, NTFS, and ReFS

FAT provides:
- Basic file system
- Partition size limitations
- FAT32 to enable larger disks
- exFAT developed for flash drives

NTFS provides:
- Metadata
- Auditing and journaling
- Security (ACLs and encryption)

ReFS provides:
- Backward compatibility support for NTFS
- Enhanced data verification and error correction
- Support for larger files, directories, volumes, etc.

DAS disks are physically attached to the server

Advantages:
- **Easy to configure**
- **Inexpensive solution**

Disadvantages:
- **Isolated because it attaches only to a single server**
- **Slower**

Server with attached disks

NAS is storage that is attached to a dedicated storage device and accessed through network shares

Advantages:

- Relatively inexpensive
- Easy to configure

NAS Device

Disadvantages:

- Slower access times
- Not an enterprise solution

Local Area Network (Ethernet)

File-level access (CIFS, NFS)

NAS offers centralized storage at an affordable price

File Server
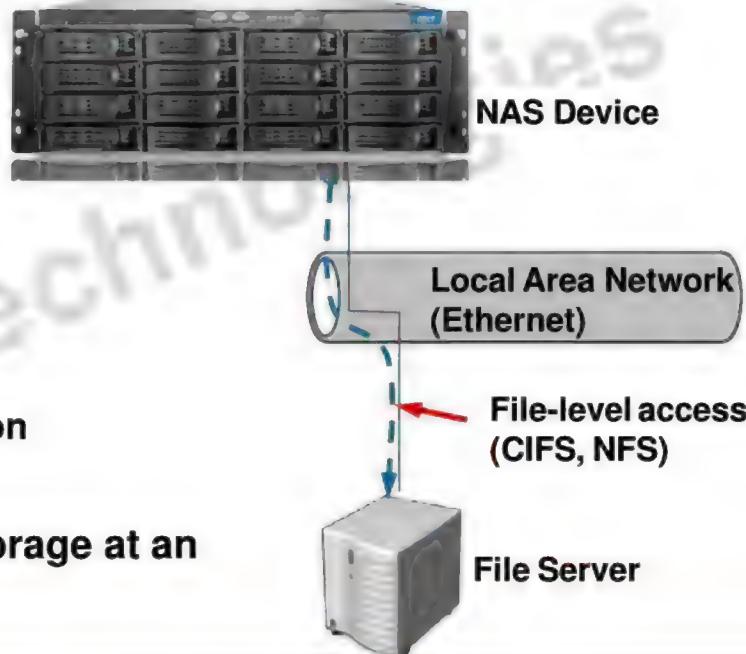
SANs offers higher availability with the most flexibility

Servers
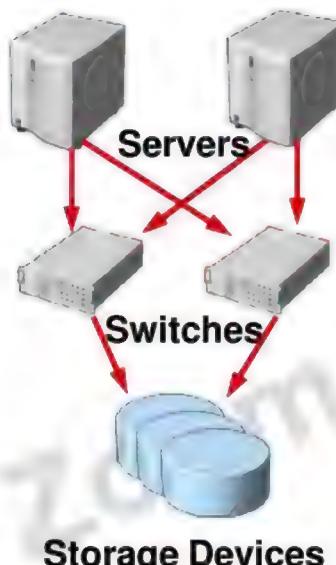
Advantages:

- **Fastest access times**
- **Easily expandable**
- **Centralized storage**
- **High level of redundancy**

Switches

Disadvantages:

- **More expensive**
- **Requires specialized skills**

Storage Devices

SANs can be implemented using Fibre Channel or iSCSI

ISCSI STORAGE

What is iSCSI storage ?

- iSCSI storage is an inexpensive and simple way to configure a connection to remote disks. Many application requirements dictate that remote storage connections must be redundant in nature for fault tolerance or high availability.

- **iSCSI transmits SCSI commands over IP networks**

Component	Description
IP network	Provides high performance and redundancy
iSCSI targets	Run on the storage device and enable access to the disks
iSCSI initiators	A software component or host adapter on the server that provides access to iSCSI targets
IQN	A globally unique identifier used to address initiators and targets on an iSCSI network

iSCSI client that runs the iSCSI Initiator

TCP/IP protocol

Storage Array
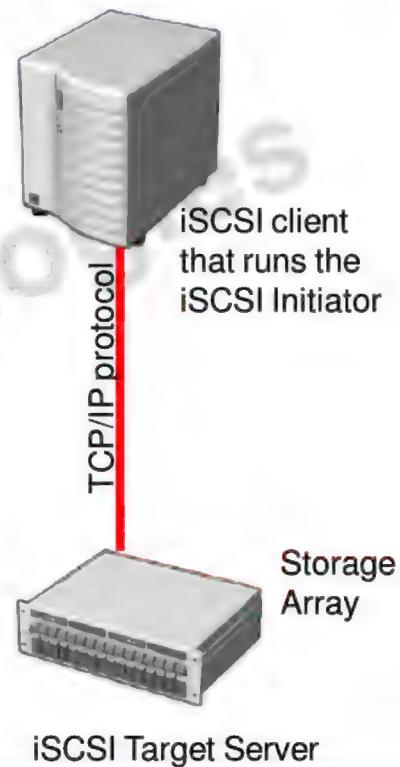
iSCSI Target Server

The iSCSI target server	The iSCSI initiator
Is available as a role service in Windows Server 2012 Provides the following features: - Network/diskless boot - Server application storage - Heterogeneous storage - Lab environments	Runs as a service in the operating system Is installed by default on Windows 8 and Windows Server 2012

- **RAID combines multiple disks into a single logical unit to provide fault tolerance and performance**
- **RAID provides fault tolerance by using:**
  - **Disk mirroring**
  - **Parity information**
- **RAID can provide performance benefits by spreading disk I/O across multiple disks**
- **RAID can be configured using several different levels**
- **RAID should not replace server backups**

Use storage spaces to add physical disks of any type and size to a storage pool, and then create highly-available virtual disks from the storage pool

To create a virtual disk, you need the following:

- One or more physical disks
- Storage pool that includes the disks
- Virtual drives that are created with disks from the storage pool
- Disk drives that are based on virtual drives

Disk Drive

↑

Virtual Disk

↑

Storage Pool

↑

Physical Disks

Virtual drives are not virtual hard disks (VHDs); they should be considered a drive in Disk Manager

What Is Fault Tolerance?

- **The ability to survive hardware failure**

- **Fault-tolerant volumes provide data redundancy**

- **Fault-tolerant volumes are not a replacement for backup**

What Is a Simple Volume?

- **Contains space on a single disk**

- **Can be extended if formatted with NTFS**

- **Spanning is not available**

- **Fault tolerance is not available**

- **Read & write speed is normal**

Administrator

Volume

- **Simple Volume (RAID-0)**

- **Mirrored Volume (RAID-1)**

- **RAID-5 Volume (Striped With Parity)**

ZOOM TECHNOLOGIES

- **Minimum - 2 Hard Disks**

- **Data is written alternately and evenly to two or more disks**

- **Spanning is available**

- **Fault Tolerance is not available**

- **Read & Write Speed is Fast**

ZOOM TECHNOLOGIES

123456

Administrator

Volume

1
3
5

2
4
6
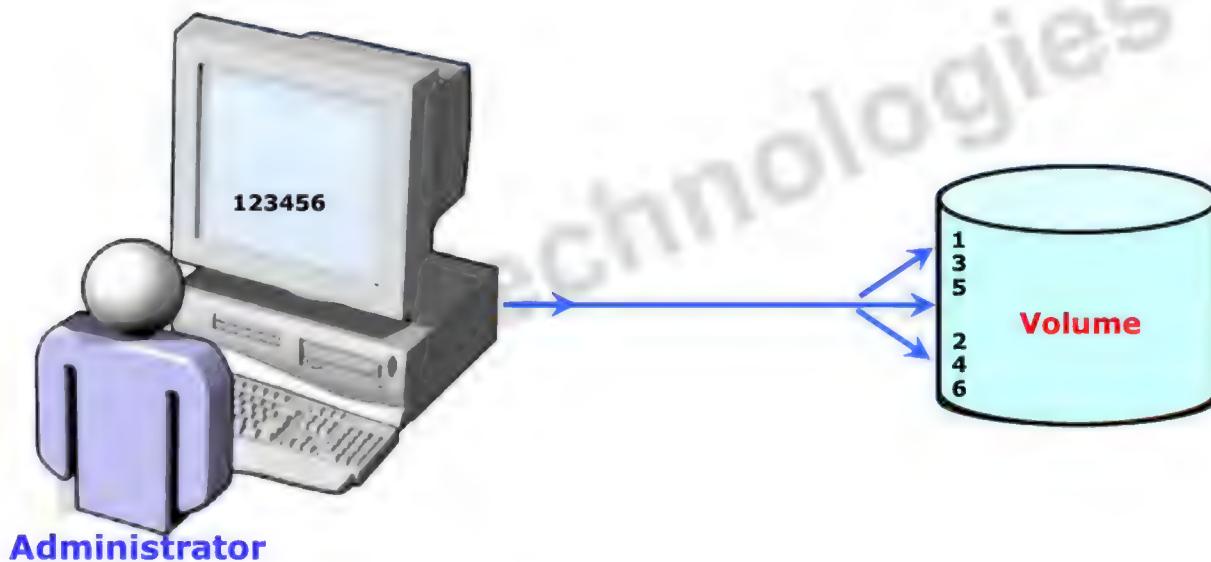
- **Minimum - 2 Hard Disks**

- **Simultaneously data will be written to two volumes on two different disks**

- **Any volume can be mirrored including the system and boot volumes**

- **Fault Tolerance is available**

- **Read Speed is Fast & Write Speed is Slow**

- **50% overhead**

123

1
2
3

Volume

1
2
3

Administrator

- **Minimum - 3 Hard Disks**

- **Data is written alternately and evenly to two or more disks and a parity is written on one disk**

- **Fault Tolerance is available**

- **Read & Write Speed is Fast,**

123456

1
3
P = 5 & 6

2
P = 3 & 4
5   Volume

P = 1 & 2
4
6

Administrator

New Disk

Data Recovered

1
3
P = 5 & 6   Disk 1

P = 3 & 4   2
6

P = 1 & 2
4   Disk 3
6

Volume

Administrator

CLOUD
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What Are Mount Points and Links?
ZOOM TECHNOLOGIES
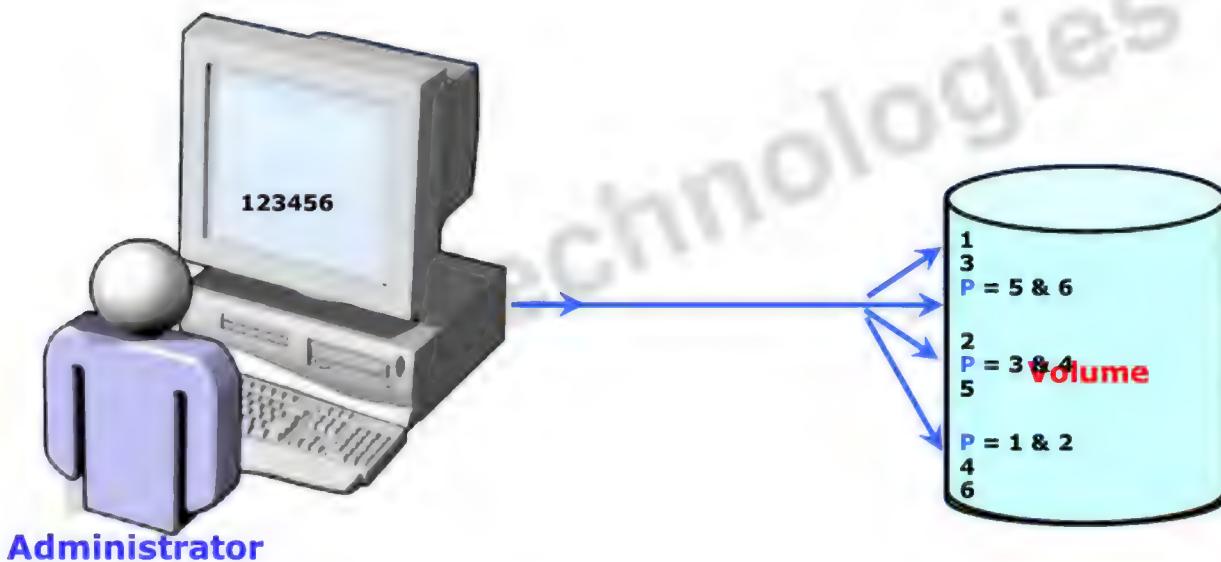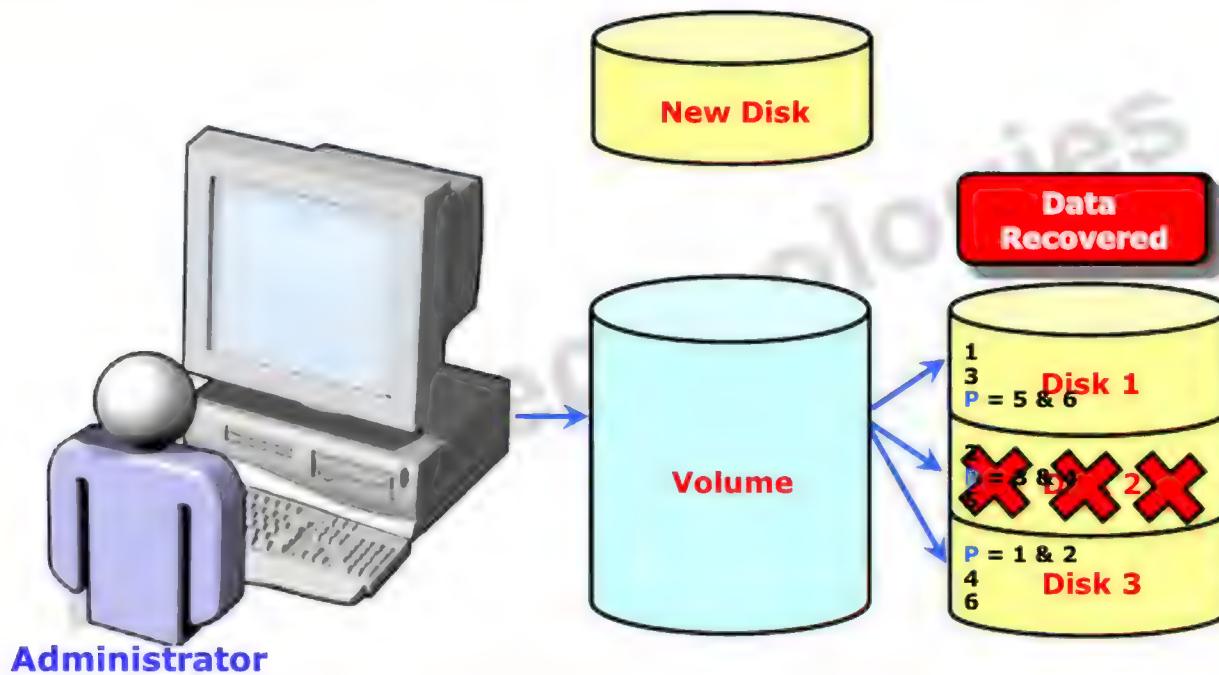
A mount point is a reference to a location on a disk that enables Windows operating system access to disk resources

- **Use volume mount points:**
  - To mount volumes or disks as folders instead of using drive letters
  - When you do not have drive letters available for creating new volumes
  - To add disk space without changing the folder structure

A link file contains a reference to another file or directory

- **Link options:**
  - Symbolic file link (or, soft link)
  - Symbolic directory link (or, directory junctions)

CLOUD
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M C S E

- Is assigned a path rather than a drive letter

- Allows you to add more drives without using up drive letters

- Adds volumes to systems without adding separate drive letters for each new volume

D:\			
File Edit View Favorites Tools Help			
Back ▾ ▾	Search Folders		
Address D:\			
Name		Size	Type
ESM			File Folder
Program data			File Folder

BACKUP AND RECOVERY
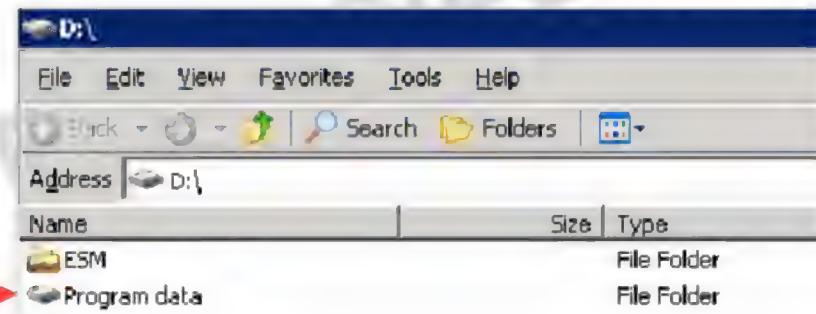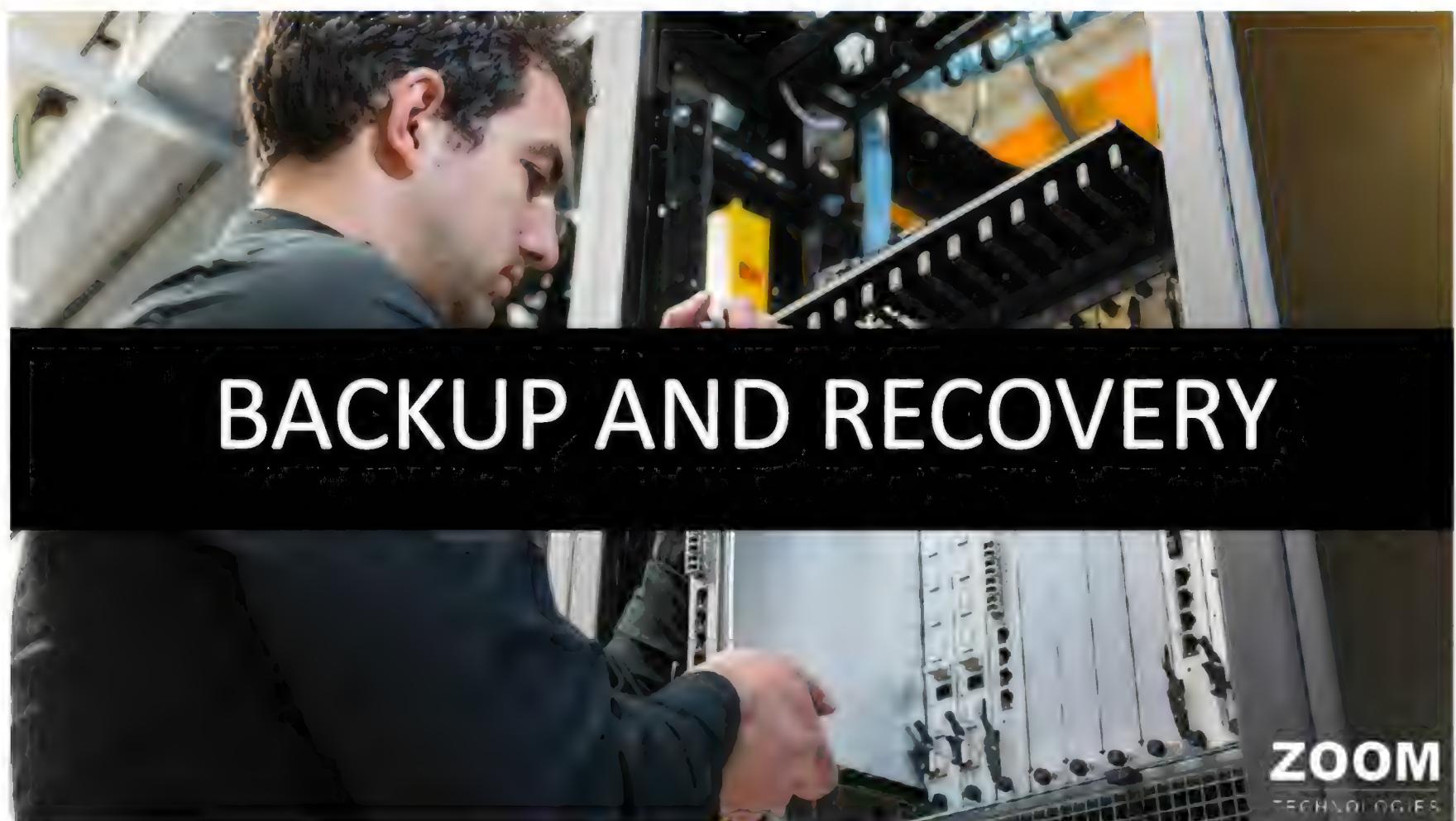
ZOOM
TECHNOLOGIES

- Copy data to alternate media

- Prevent data loss

- Only Administrators can backup the data

Back Up Data

Back Up Data   Corrupted Data   Restore Data

ZOOM TECHNOLOGIES

Register Server Wizard

Encryption Setting

Account Credentials
Proxy Configuration
Encryption Setting
Server Registration

Enter a passphrase to encrypt all backups from this server. Note that your existing backups will still be accessible after this change.

- Passphrase must be 16 characters long
- Use strong password guidelines.
- Do not use recognizable words or phrases.

Enter passphrase (minimum 16 characters)

●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●● [Generate passphrase]

Confirm passphrase

●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●

[Apply and copy to clipboard]

⚠ Please make sure to keep a copy of your passphrase in a safe location. If the passphrase is lost or forgotten, customer support will not be able to assist you in recovering access to your backed up data.

[< Previous] [Next >] [Register] [Cancel]

ZOOM TECHNOLOGIES

Schedule Backup Wizard

Select Items to Backup

Getting started
Select Items to Backup
Specify Backup Time
Specify Retention Setting
Confirmation
Modify Backup Progress

Click Add Items to select the files and folders you want to backup.

Name

[Add Items] [Remove Items]

[Exclusion Settings]

ⓘ If a backup location includes file types or sub-folders that you do not want to back up, click Exclusion Settings to remove those items from the backup.

[< Previous] [Next >] [Finish] [Cancel]

ZOOM
TECHNOLOGIES

Schedule Backup Wizard

Specify Backup Time

Getting started
Select Items to Backup
Specify Backup Time
Specify Retention Setting
Confirmation
Modify Backup Progress

Backup on the following days:

☐ Sunday   ☐ Monday   ☐ Tuesday
☐ Wednesday ☐ Thursday ☐ Friday
☐ Saturday

At the following times (Maximum 3 times per day)

Available time:

| 12:00 AM |
| 12:30 AM |
| 1:00 AM |
| 1:30 AM |
| 2:00 AM |
| 2:30 AM |
| 3:00 AM |
| 3:30 AM |
| 4:00 AM |
| 4:30 AM |
| 5:00 AM |
| 5:30 AM |

Add >

Scheduled time:

ⓘ You can optimize network usage for backup by clicking Change Properties and specifying the network throttling option.

< Previous   Next >   Finish   Cancel

CLOUD
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M C S E

ZOOM
TECHNOLOGIES

Schedule Backup Wizard

Specify Retention Setting

Getting started
Select Items to Backup
Specify Backup Time
Specify Retention Setting
Confirmation
Modify Backup Progress

How long do you want to keep your backups for?

Retain my backups for a maximum of   7 ▼ Days

Note: Microsoft Online Backup Service will always keep the latest version of your backup. Once a file is deleted, moved, renamed or overwritten, the older file is then kept for the number of days specified before it is removed from the backup.

If the storage destination runs out of space to store the specified amount of backup, the backup will fail. To continue backup, reduce retention range so that older backups are deleted.

< Previous   Next >   Cancel

CLOUD
EXCHANGE
M C S E

ADVANCED TOPICS

ZOOM TECHNOLOGIES

- **Domain Services (AD-DS)**

- **Lightweight Directory Services (AD-LDS)**

- **Rights Management Services (AD-RMS)**

- **Federation Services (AD-FS)**

- **Certificate Services (AD-CS)**

Lightweight Directory Services (AD-LDS)

ZOOM TECHNOLOGIES

- **AD LDS Provides an LDAP accessible directory service that supports identity management scenarios**

- **Removes all other AD DS features**
  - **No Kerberos authentication**
  - **No forests, domains, DC, GC, sites, group policies**
  - **No dependency on DNS**

- **Each AD LDS server can host multiple directory stores (i.e. instances)**

- **Within each instance**
  - **Schema partition**
  - **Configuration partition**
  - **Zero or more application partitions**

Rights Management Services (AD-RMS)

- **RMS enables customers to keep internal information internal**
  - **Confidential files protection**
  - **E-mail forwarding**
  - **Web applications**
- **Benefits:**
  - **Safeguards sensitive internal information**
  - **Digitally enforces organization policies**
  - **Persistently protects information**
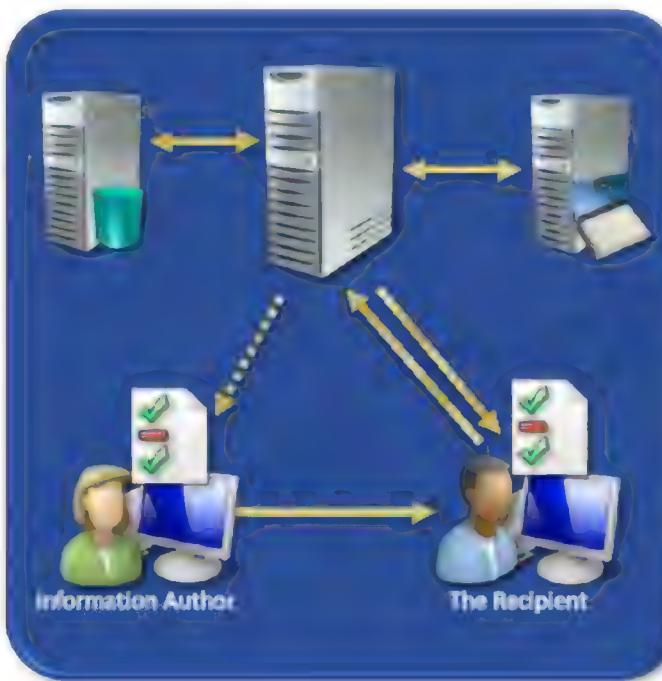
- Author receives a client license certificate the "first time" they right-protect the information.
- Author defines a set of usage rights and rules for their file & creates a "publishing license" to encrypt file.
- Author distributes file.
- Recipient opens the file, the application calls the RMS server which validates the user and issues a "use license."
- Application opens the file and enforces rights.

Federation Services (AD-FS)

- AD FS provides an identity access solution

- AD FS is a service that allows for the creation of federated relationships between organizations for web application authentication

- Deploy federation servers in multiple organizations to facilitate business-to-business (B2B) transactions

- AD FS provides a Web-based Single Sign-On (SSO) solution

- AD FS improved in Windows Server 2008
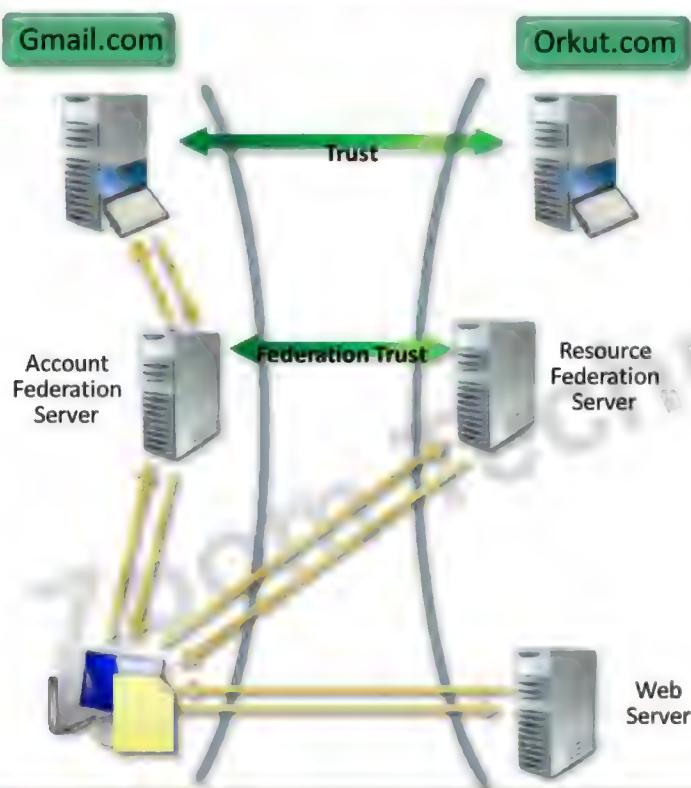
- Client contacts Web server to access web page
- Web SSO agent intercepts request
- Client is redirected to FS-R for discovering the resource
- Client is redirected to FS-A for authentication
- FS-A sends the request to Domain Controller and authenticates user
- Client is redirected back to FS-R
- Web SSO agent intercepts request, checks authentication, and sends request to Web server

Certificate Services (AD-CS)

- AD CS Provides PKI certificate issuance and management services

- Not significantly different than CS in 2003

- Provides a certificate issuance and Certification Authority (CA) service

- Issues Digital certificates to web server for Secure data transfer (HTTPS)
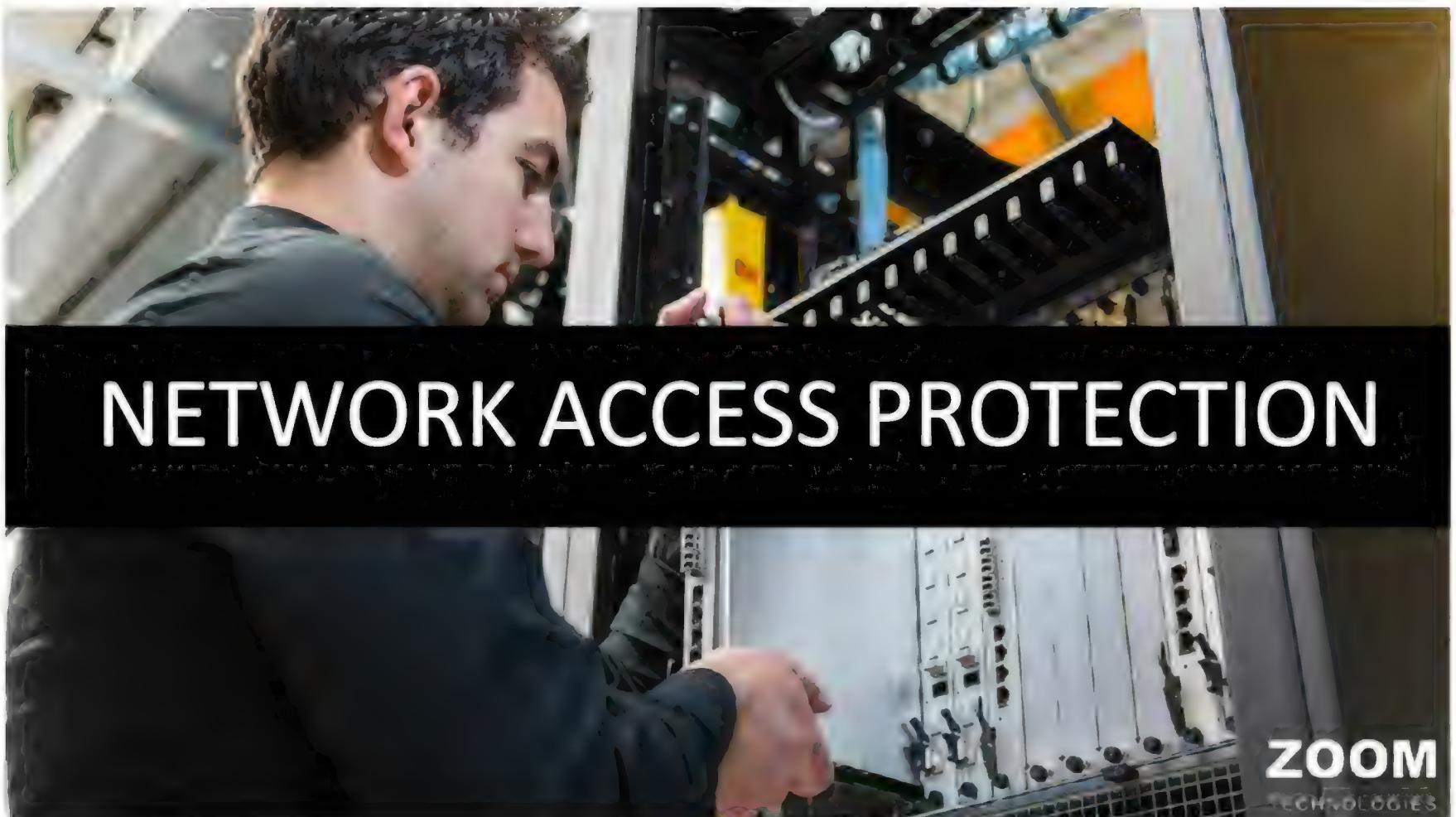
NETWORK ACCESS PROTECTION

ZOOM
TECHNOLOGIES

What is Network Access Protection?

Health Policy Validation

Health Policy Compliance

Ability to Provide Limited Access

Enhanced Security
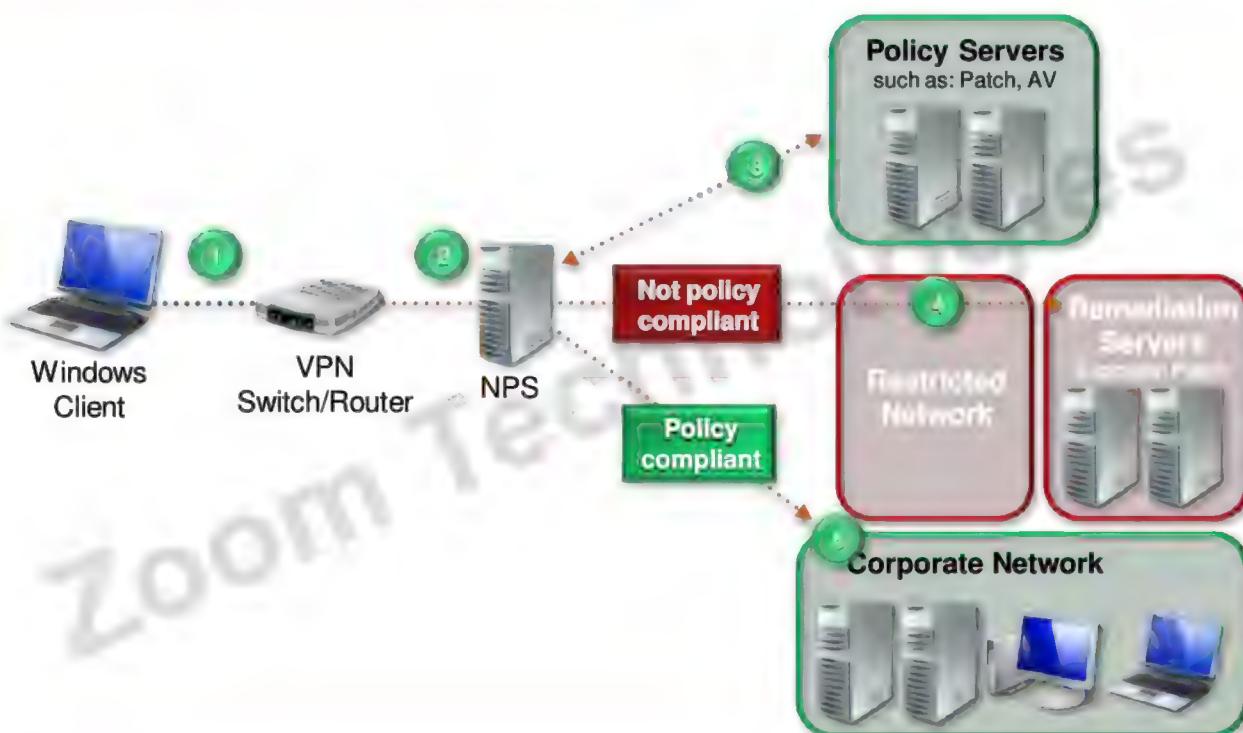
NETWORK LOAD BALANCER

- Network Load Balancing (NLB) uses a distributed algorithm to balance IP traffic load across multiple hosts. It helps to improve the scalability and availability of business-critical, IP-based services.

- NLB also provides high availability, because it detects host failures and automatically redistributes traffic to surviving hosts.

- Windows Server 2012 NLB clusters can have between 2 and 32 nodes.

- Balances traffic based on node utilization

  - New traffic will be directed to the node that is being utilized the least
  - You can configure NLB to preference some nodes over others

Client

Accept? → Network Load Balancing Host
Dedicated IP: 10.1.1.2
Virtual IP: 10.1.1.1
No

Accept? → Network Load Balancing Host
Dedicated IP: 10.1.1.3
Virtual IP: 10.1.1.1
No

Accept? → Network Load Balancing Host
Dedicated IP: 10.1.1.4
Virtual IP: 10.1.1.1
Yes

Accept? → Network Load Balancing Host
Dedicated IP: 10.1.1.5
Virtual IP: 10.1.1.1
No
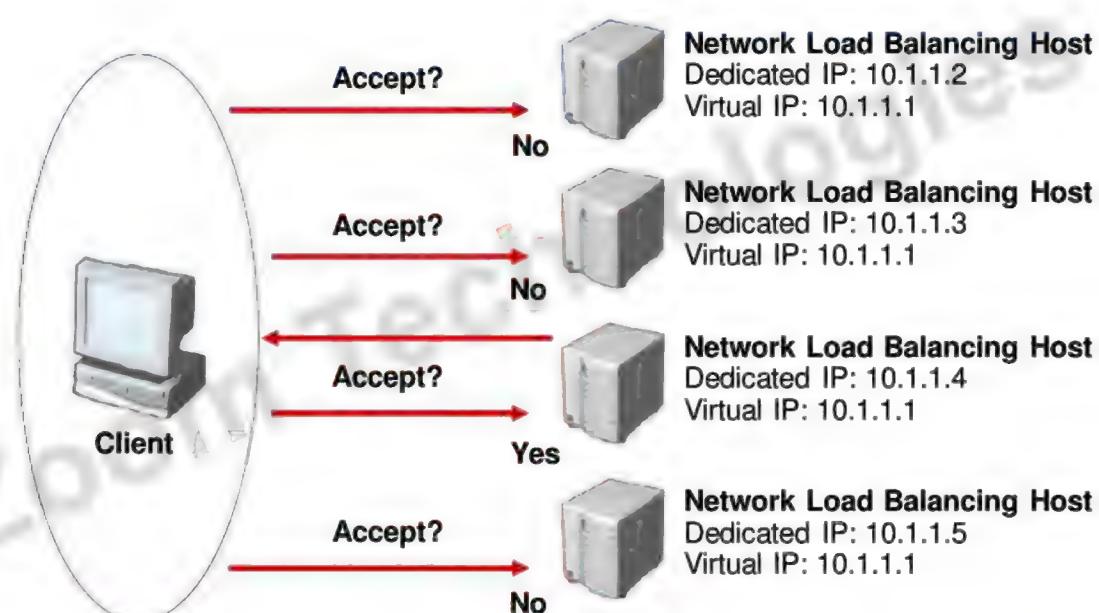
- NLB cluster heartbeats are transmitted every second between nodes in a cluster

- Convergence occurs when:

  - A node misses five consecutive heartbeats, at which time it is automatically removed from an NLB cluster

  - A node that was member of a cluster returns to functionality

  - An administrator adds or removes a node manually

FAILOVER CLUSTERING

- Failover clusters in Windows Server 2012 provide a high-availability solution for many server roles and applications.

- By implementing failover clusters, you can maintain application or service availability if one or more computers in the failover cluster fails.

- A failover cluster is a group of independent computers that work together to increase the availability of applications and services.

- Physical cables and software connect the clustered servers, known as nodes.

- If one of the cluster nodes fails, another node begins to provide service. This process is known as failover. With failover, service disruptions are minimized.

Failover cluster

Virtual Machine 1
Virtual Machine 2

Virtual Machine 3
Virtual Machine 4

Cluster Node 1

Cluster Node 2

Storage Area Network

Cluster Shared Volume

Virtual Machine 1 VHD

Virtual Machine 3 VHD

Virtual Machine 2 VHD

Virtual Machine 4 VHD

What Is High Availability?

- One of the most important characteristics of any Information Technology (IT) system is availability. Availability refers to a level of service that applications, services, or systems provide.

- Availability is expressed as the percentage of time that a service or system is available. Highly available systems have minimal downtime, whether planned or unplanned, and they usually need to be available on a 24-hour-a-day basis.

- These systems are typically available more than 99 percent of the time, depending on the organization's needs and budget

- Increased scalability. In Windows Server 2012, a failover cluster can have 64 physical nodes and can run 8,000 virtual machines on each cluster

  What Are CSVs?

- In a classic failover cluster deployment, only a single node at a time controls a LUN or a volume on the shared storage.

- This means that the other nodes cannot see shared storage until each node becomes an active node. CSV is a technology introduced in Windows Server 2008 R2 that enables multiple nodes to share a single LUN concurrently.

- Each node obtains exclusive access to individual files on the LUN instead of the entire LUN.

- In other words, CSVs provide a distributed file access solution so that multiple nodes in the cluster can simultaneously access the same NTFS file system

Quorum

- Quorum is the number of elements that must be online for a cluster to continue running. In effect, each element can cast one vote to determine whether the cluster continues to run.

- Each cluster node is an element that has one vote.

- In case there is an even number of nodes, then an additional element, which is known as a witness, is assigned to the cluster.

- The witness element can be either a disk or a file share. Each voting element contains a copy of the cluster configuration; and the Cluster service works to keep all copies synchronized at all times

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